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Blend Space: Architectural Storytelling in the Age of Mixed Reality

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BLEND SPACE

Architectural Storytelling in the Age of Mixed Reality

GRANT MOEHLenhoFF

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Architectural Storytelling in the Age of Mixed Reality

by
Grant Moehlenhoff

A Design Thesis Project
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abstract

Storytelling and narratives have long been traditions for communication in human culture. Hieroglyphics, cave paintings, and stone tablets became the mediums in which this common method of communication began. The reasons why people tell stories are numerous, the most common ones being to entertain, to keep cultural heritage, to transfer knowledge, or provide warnings to others of danger [17]. In addition, cultures often use architecture as a place to embed these narratives.

As technology has rapidly developed, so have the modes for telling stories. Today, stories are moving beyond the physical, and into both virtual and mixed realities. Virtual and augmented reality technologies are receiving more investments as well as becoming more prevalent with the capability to impact society in a number of ways. These technologies are also shaping the way stories are being told and how they are experienced, focusing on the human perspective. While storytelling has been a part of architecture for centuries, the subject of merging mixed reality technology with fundamental architectural elements to convey a narrative remains untapped.

Therefore, this thesis explores the question of how designers can reinvent architecture as a vehicle for storytelling in the age of mixed reality.

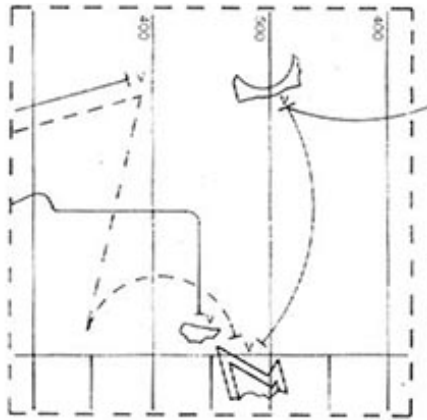
It is imperative for the profession of architecture to embrace the powerful possibilities of mixed reality technology as it affords designers the ability to communicate, design, and experience both information and narratives in uniquely humanistic ways by enhancing basic human senses such as sight, sound, and touch. This approach effectively focuses on the user experience which is an often overlooked aspect of design.

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01

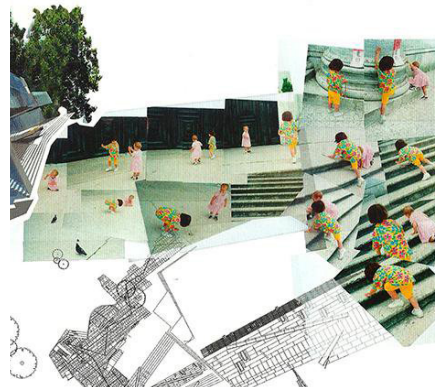
structuring the concepts: architecture and storytelling

Architecture's relationship with storytelling can be traced back through many periods as designers have continuously used storytelling within architecture to enrich spaces. The ancient civilizations infused processional and ritual stories into their architecture; Gothic architecture sculpted imagery of stories on to the facades of cathedrals. Many of the Gothic cathedrals also melted biblical narratives in stained glass, providing information to the illiterate. Contemporary architects have used material presence to convey meaning. Peter Zumthor's *Home for Senior Citizens* expresses a narrative through architecture that engages the users' emotions to enhance the living experience. Zumthor creates a rural atmosphere within a suburban environment where the materials and the space work in tandem to evoke the story of the citizens. The intent was for the inhabitants to feel at home, an impression enhanced by the use of elements which they recognize from their own lives in the surrounding villages. Even theme parks provide an example of storytelling, although extreme. These steel jungles often falsify reality in order to construct a narrative experience in which architecture plays a key role in contributing to the magic. Current discourse on architectural narrative suggests that a series of events or impressions of space can be 'read' through a sequencing of spaces and views within a building. We as designers often embed this sequencing within architecture to enrich our spaces.



LEARNING FROM DATA

- Site Analysis
- Program Analysis
- Daylight Analysis
- Material Analysis
- Narrative Texts



LOOKING AT PEOPLE IN CONTEXT

- Images
- Videos
- Site Visits

This relationship between architecture and storytelling is still significant in contemporary practice. It is imperative for designers to analyze narratives from multiple vantage points including human, social, and cultural aspects. In order to understand narratives more appropriately, designers utilize both objective and subjective data which drive our design decisions. According to Jane Fulton Suri of IDEO, information gathering methods can be classified under four general levels that range from the objective to subjective [35].

The category of “trying things ourselves” involves a subjective, or not easily measured, perspective. Information gathering methods such as projective user scenarios and memories rely strongly on a human understanding of narratives, as opposed to site analysis, which references more objective, contextual information about the story. “Trying things ourselves” involves a careful reading and interpretation of stories in order to extract architectural data to then design. This approach aims to spur designers’ imagination, by providing carefully selected and relevant experiences unlike those we are exposed to in our own everyday lives [35].



ASKING PEOPLE TO PARTICIPATE

- Conducting Interviews
- Obtaining user feedback



TRYING THINGS OURSELVES

- Projective User Scenarios
- Memory
- MIXED REALITY

To quote the Chinese philosopher Lao Tse:

“What I hear I forget. What I see, I remember. What I do, I understand!”

This adage implies that there is additional value in communication methods that allow a designer to ‘experience it themselves’ rather than witnessing a demonstration or someone else’s experience. The more that explorations and representations of insights, evidence, design ideas and final concepts can be made experiential in some way, the more all parties - team members, clients, decision makers and users - will be able to grasp how the representations relate to other people’s experience.

mixed reality enhances human senses

Mixed Reality (MR) technology falls within this category. Mixed reality is an experiential technology involving sight, sound, and touch. It affords designers the opportunity to experience narratives for themselves in a uniquely humanistic way throughout multiple phases of the design process. MR bridges the gap between reality of the human narrative and our consciousness interpreting the story into our reality. In the virtual environment, one's own consciousness is the medium of understanding [20].

MR also provides a unique platform for storytelling. There is an opportunity for design to contribute to the shaping of experiences. Thus, the increasing amounts of information being saved as a result of emerging technologies creates a need for designers to grapple with meaning, representation, and context [29]. MR experiences can permit multi-sensory responses in participants, or in this case designers, while resisting their passive consumption of information. This allows for additional dimension and depth of the user. MR explorations can push understandings beyond the standard context and into more experiential interpretations.

MR and virtual reality are influencing the way that spaces are designed and it is changing our experience of the built environment [40]. The major benefit provided by immersive MR environments to architecture is interactivity.

The problem with common visualization practices is that they only address a single aspect of visual-spatial-perception, that being imagery. MR, on the other hand, allows for a deeper sense of immersion by calibrating ocular, auditory, and tactile senses. Immersive technologies are becoming more mainstream, improving in quality, accessibility and becoming more affordable through immersive experiences. This transition allows spatial disciplines, like architecture, to revisit possibilities for using such technology in the design process [22].

Authorship is a critical component within the implementation of mixed reality in architectural storytelling. The inherent “simulation” nature of mixed reality can pose conflicts in the morality of using technology to convey a message through a marriage with architecture. Maintaining authenticity, while allowing individuals to interpret information for themselves is necessary in this approach. Particularly for mixed reality, this means that designers must blend raw data, information, images, videos, and other media with architecture in an unbiased manner or at least be transparent about the intended message.



Google's *Pearl*

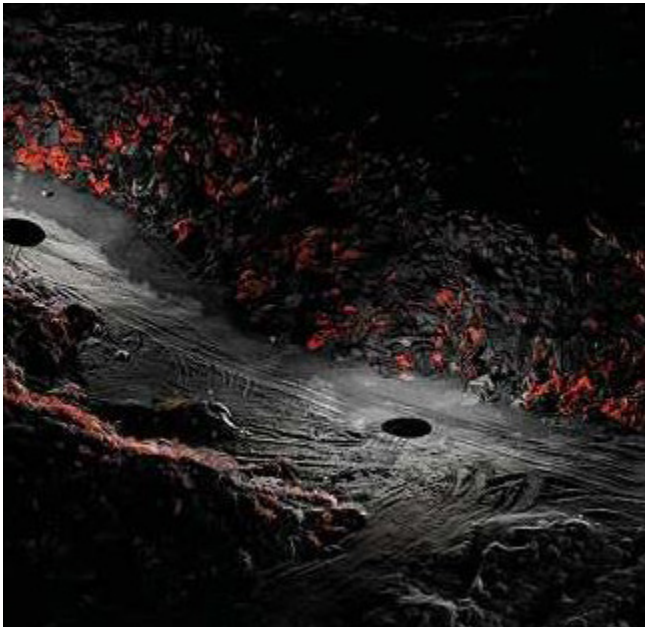
immersive storytelling precedents

Precedents of immersive storytelling experiences are more often found within the entertainment industry in contemporary society. “Pearl” is a Google Spotlight Story from Patrick Osborne. It received an Oscar nomination in the animated short category in [31]. This short film depicts a coming of age story that follows a father-daughter narrative through a third person perspective in the passenger seat of a car. Here, the narrative is a fully immersive, 360-degree animated short film that allows viewers to use their phones, allowing them to find their own unique vantage point and understanding of the story [31]. It is the first such film to have full support for a VR headset that provides viewers with the opportunity to move around the car and even stick a head out of the sun roof [31]. While this experience is emotionally engaging, its purpose is simply to inform and entertain and does not present discussions regarding space and design.



WITHIN's *The Displaced*

Another company is using the power of MR to communicate narratives to the masses. WITHIN, founded in 2014, is a destination for innovative, entertaining, and informative story-based virtual and augmented reality. This company creates immersive experiences of narratives set in imaginative worlds as well as documentaries taking further into the world of news and storytelling. This emerging company is providing a platform to begin sharing knowledge and narrative through virtual environments which is crucial to impacting the masses. Though WITHIN is utilizing the powerful potential of storytelling through MR, which supports the notion that a similar method to design could result in a revolutionary change for the industry of architecture, this platform, too, does not bring these characteristics into the discourse of architecture.



Displaced Witness - ScanLab project

These immersive storytelling experiences are beginning to impact architecture and how a space is designed for these moments. This immersive storytelling experience takes place on a consistent surface of transplanted 1 meter by 1 meter textures from the island of Lesbos, digitally re-enacted from 3D scan data [7]. *Displaced Witness* asks the viewer to bare spatial witness to the people and landscape of Lesbos [7]. In the center, viewers begin an act of sensory transportation. The sound of a local village's coastline resonates in their ears, pebbles crack beneath their feet [7].

The *Displaced Witness* exhibition by ScanLab Projects presents a blend between physical and mixed realities through a sensory transportation that involves sight, sound, and touch.



the *Empathy Effect* - HGA

HGA, an architectural firm in Minneapolis, is employing MR in order to convey a user experience. Their project titled, “The Empathy Effect,” is a blended physical and virtual experience simulating how people of different ages and abilities move through an environment [9]. The VR experience simulated vision impaired by cataracts, glaucoma, or macular degeneration [9]. While in the virtual headset, users wore a body suit to increase the immersion into the narrative of the research. However, this project divides the virtual and real into separate experiences for which designers experience the virtual to simulate the physical of a potential user.



Remote Site Studio - Syracuse University

A recent research study from Syracuse University used virtual technology as a means for connecting remote site experiences to the educational studio. Using immersive design technologies to remotely design for an informal Settlement in Rio, Brazil, the students would not physically visit the site until the end of the semester where they presented their final work to the local community [22].

The studio led to positive results on the potential of immersive environments to supplement site experiences [22]. However, this too, divides the mixed and real into separate experiences.

In contrast to these examples, this thesis seeks to marry both virtual and augmented reality with physical architecture simultaneously, in order to enhance the relationship between architecture and storytelling while focusing on the user experience. This balanced fusion of mixed reality and physical architecture is understood through a language of blended interactions between realities.

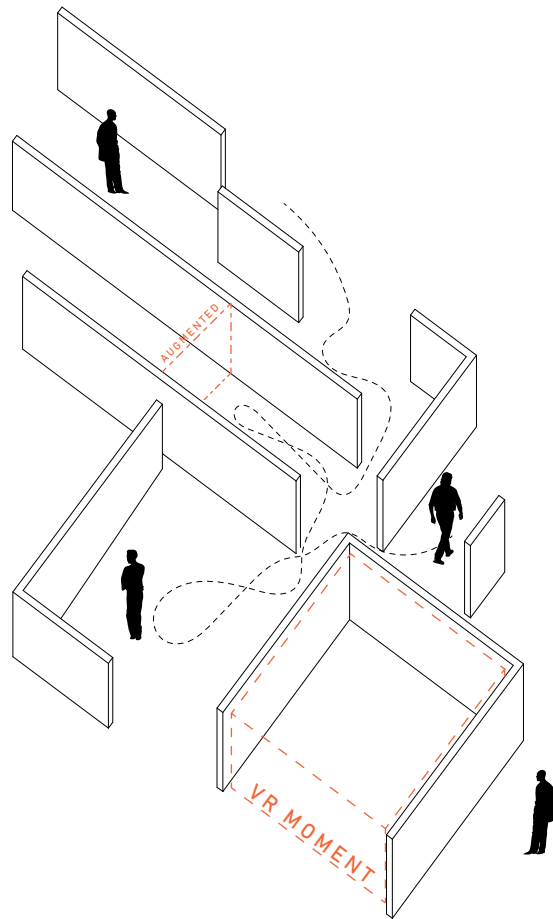
02

blended interactions

a balanced fusion between realities

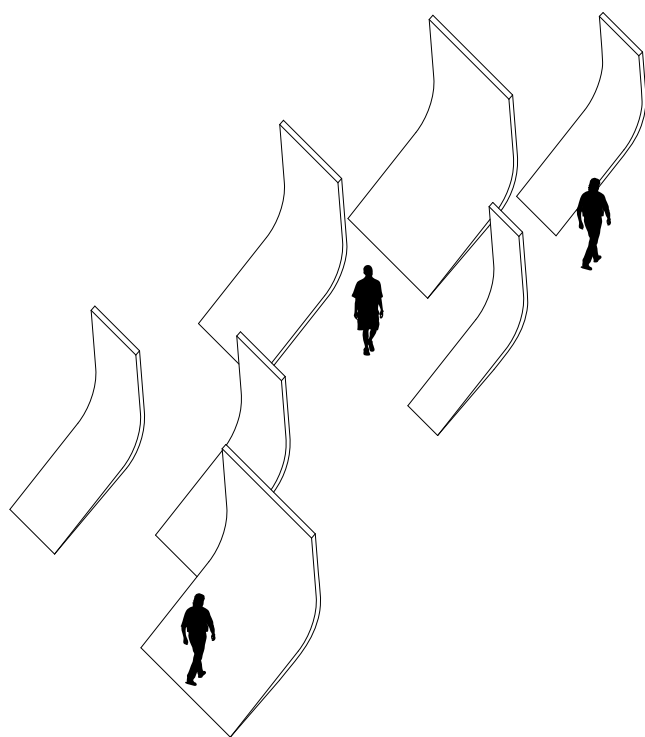
Blended interactions are defined as methods of employing mixed reality technology within the design and experience of architecture to immerse a user into a multi-sensory, multi-spatial experience of the narrative. These interactions are locomotion, body physics, gaze, grab, sound, and tactile feedback. Blended interactions weave narrative, site context, and architecture into interactive moments that occur simultaneously in the physical and alternative reality. To simplify, mixed reality fills in the gaps of what architecture cannot do, and architecture fills in the gaps of what mixed reality cannot do.

For example, mixed reality technologies are not able to express temperature, the feeling of sun on your skin, and wind which are all conditions of the site that are important to a design and place-making. Also, the gravity of walking up a ramp or stairs is an architectural component that is not able to be expressed through a purely mixed reality experience. On the other hand, architecture does not have the ability to overlay information, or transport humans to an alternate space complete with augmented sounds, sights, and textures. Thus, in this thesis, the language of blended interactions are employed to bridge the gaps between these realities in order to create a new, hybrid architecture that provides immersive narrative capabilities through a blend of physical architecture and mixed reality technology.



locomotion

includes physical and overlaid barriers that can guide movement
as well as restrict



body physics

involves weight and gravity which affects speed of movement



quote from narrative

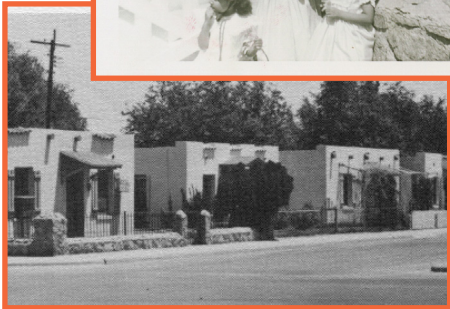
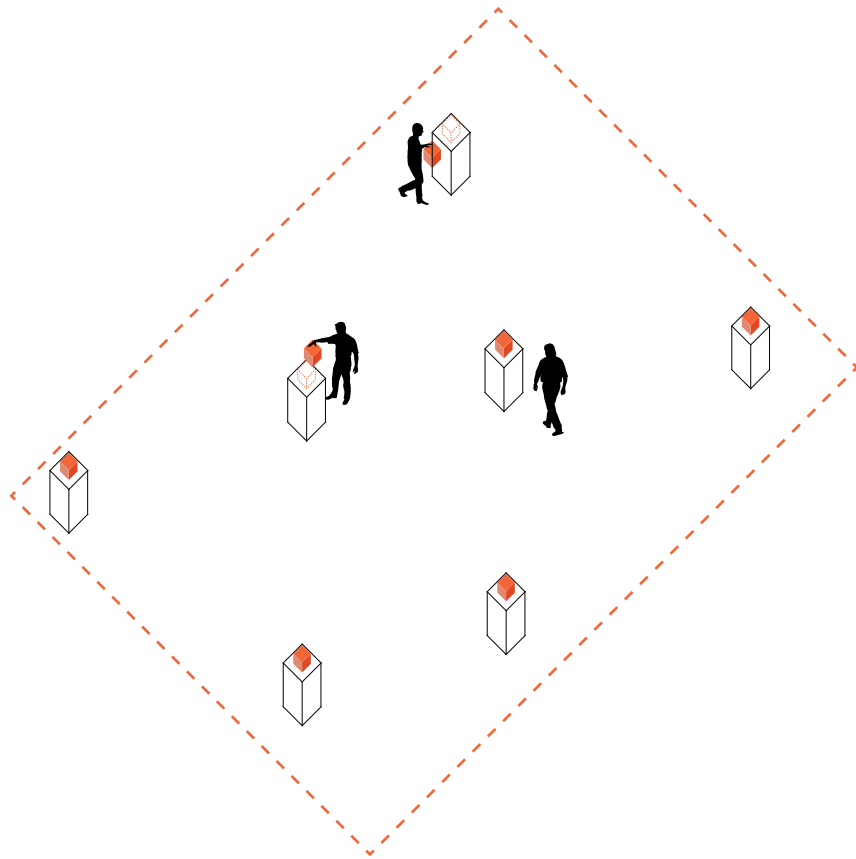


IMAGE TITLE

LOOK TO INTERACT

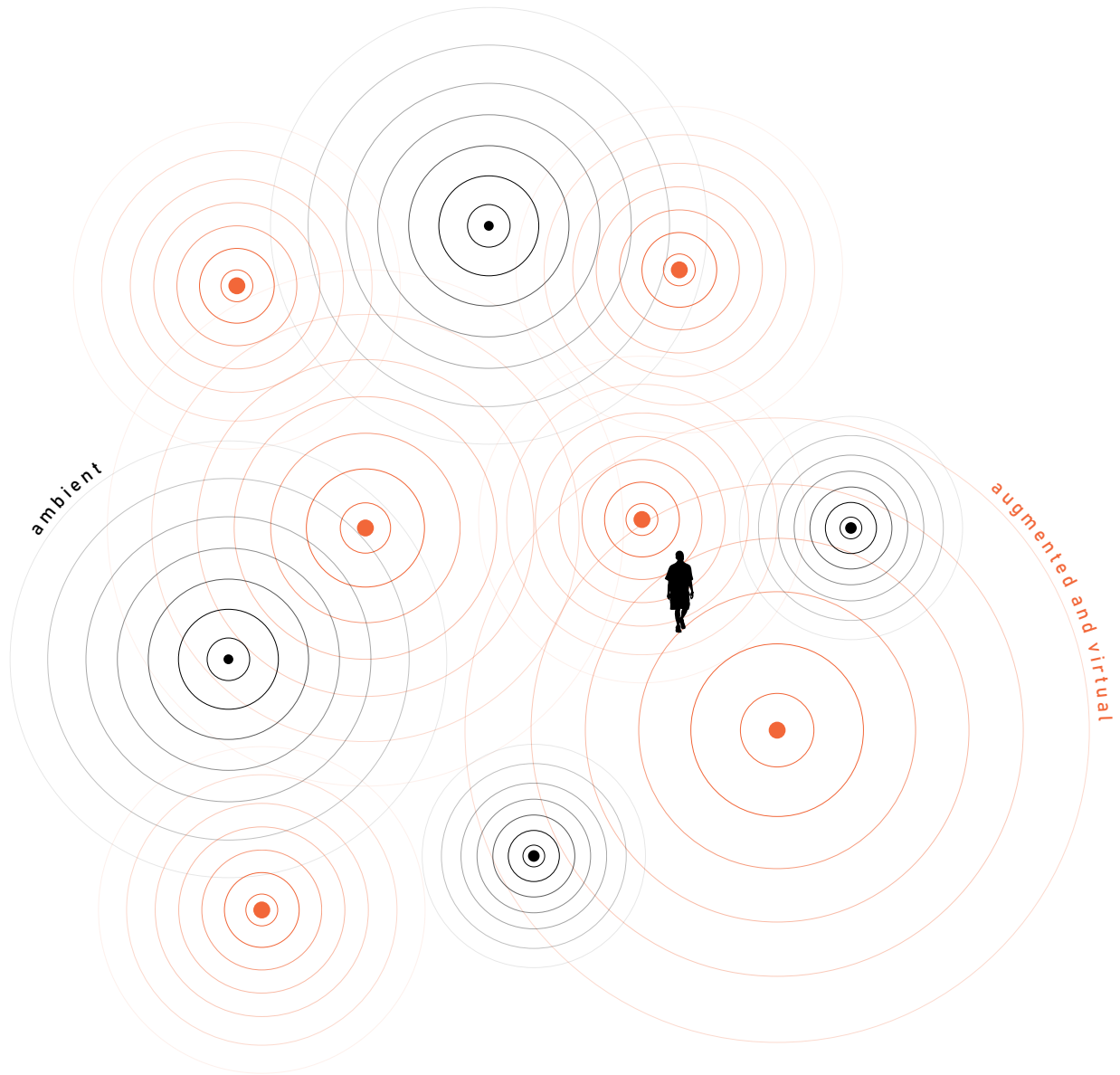
gaze

involves using the eye's direction, duration, and movement to interact with objects; also involves height and vision clarity



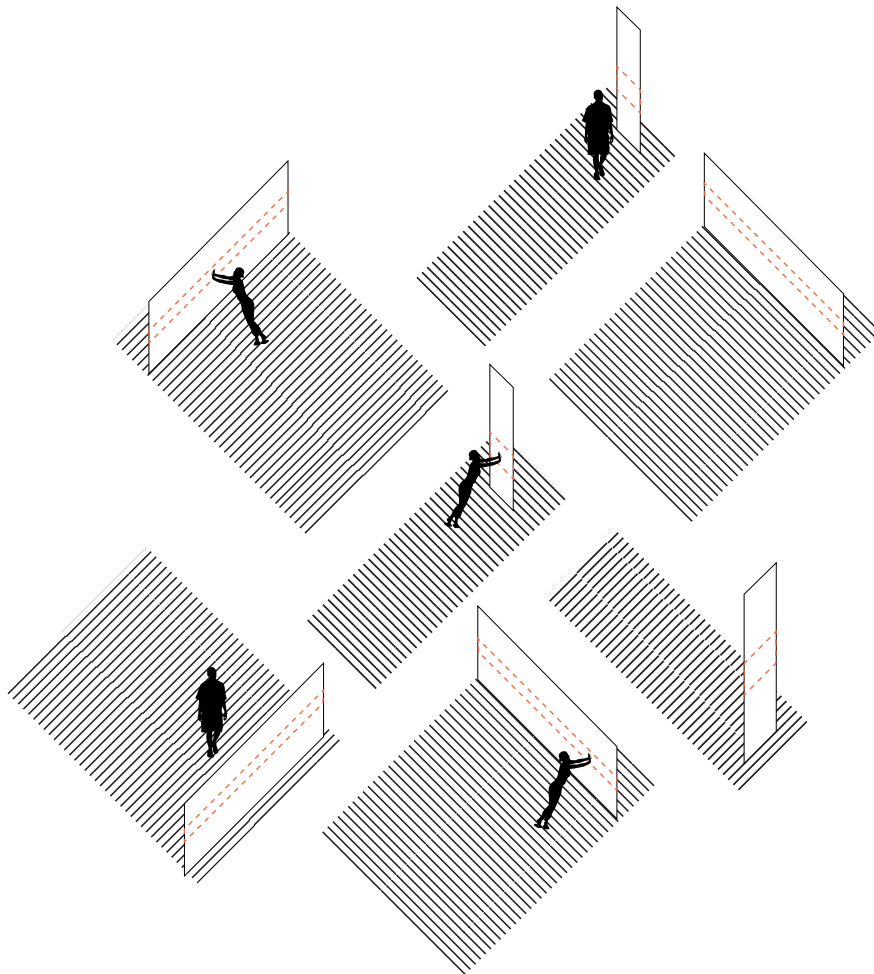
grab

includes picking up, throwing, placing, and displacing objects



sound

encompasses music and narration which can help set a mood and can direct attention



tactile feedback

includes a vibration, or touch, in response to the designer engaging with something in the space

03

structuring the project:

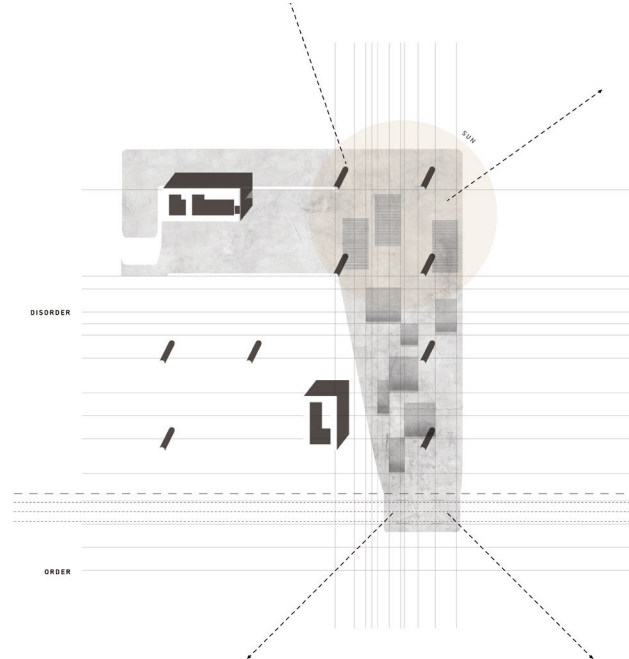
narrative - driven design process

This thesis uses a narrative-driven design process in order to understand how the language of blended interactions is embedded into practice. Using a floor plate as the design origin, the process begins by extracting critical architectural elements as well as narrative arcs from factual accounts. Then these extractions lead to the shaping of physical architecture as well as the blending of physical, augmented, and virtual space through the design of blended interactions. The experience is tested in VR and observations about what is learned from the experience are made. These considerations are then used to revise the architectural solution in order to create a more immersive, mixed reality experience. Through this process, the physical, augmented and virtual work together, filling in the gaps of what the other cannot do.



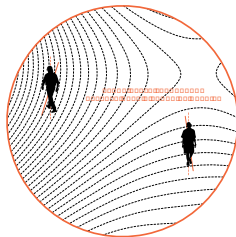
extract

The process begin with the step of extraction. This step uses multiple forms of primary source documentation in order to extract factual data about the space, story, and experience. Elements such as grid, rhythm, texture, site, and volume were all considered when extracting.

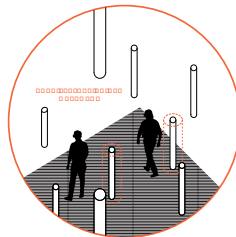


shape

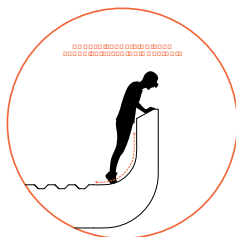
These extractions allowed the physical architecture to then be shaped in response to the specific narratives. Cutting, removing, shifting, angling, extending, and other manipulations occur. In this step, accounting for the immediate site context is important and can enhance the end-user experience.



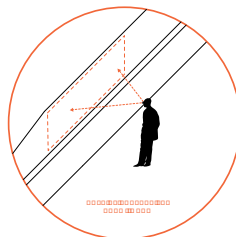
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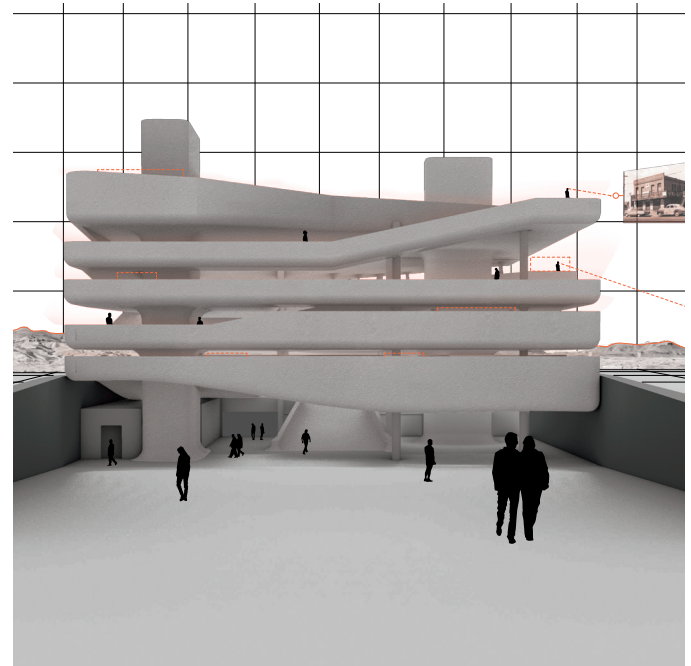
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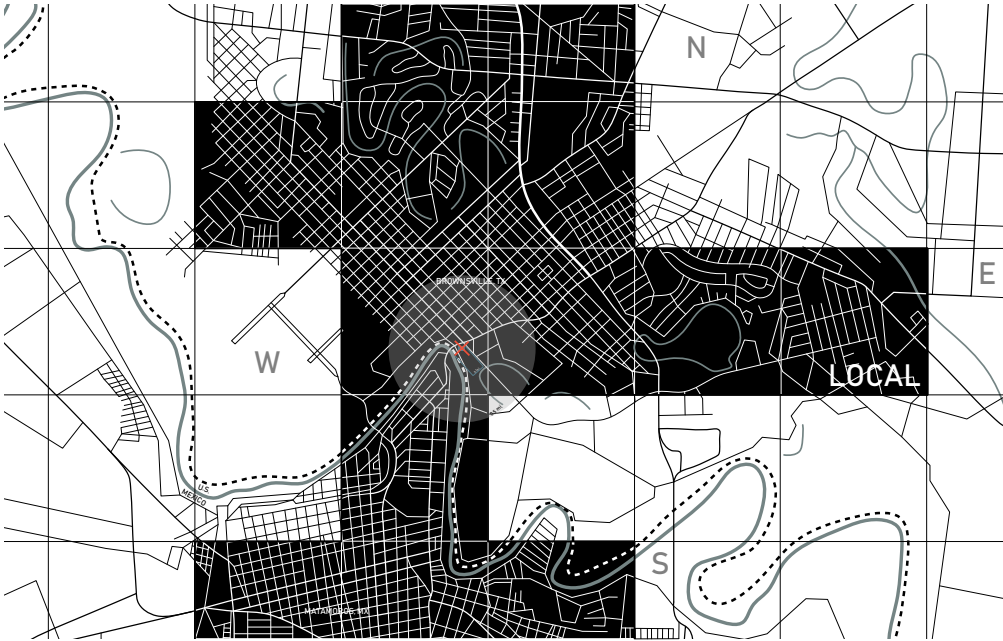
blend

As the physical architecture takes shape, blended interactions are employed, establishing the concept of blend space in this narrative. This is where the design works to blend physical, augmented, and virtual space together, creating a blend space that immerses the user into a narrative.

experience

The interactions and space compose an experience of blended space through mixed reality technology which communicates a narrative. This experience relies on a mixed reality headset.

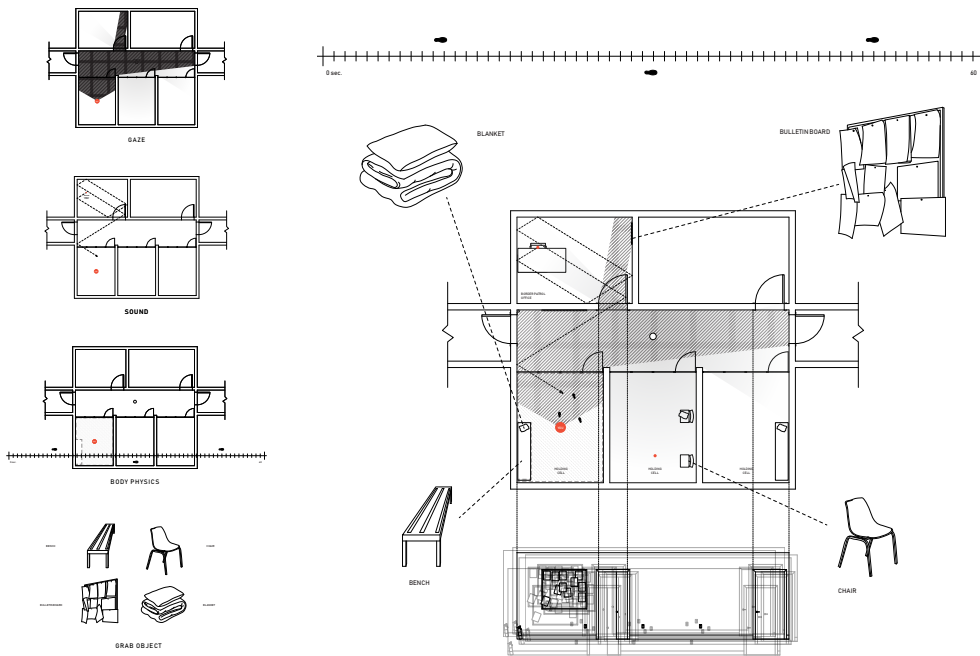
BORDER TRAVERSED



INTERACTIONS

SETTING

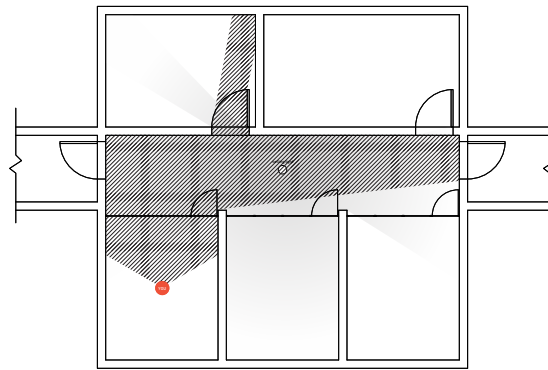
CHARACTERS



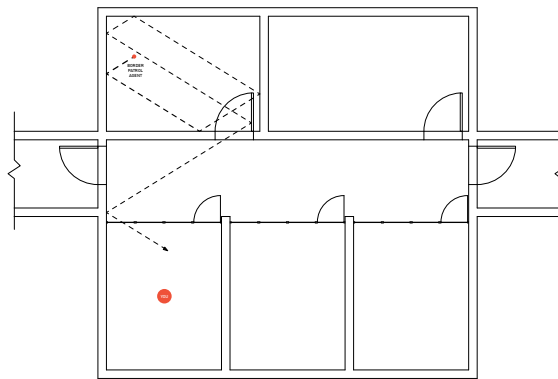
initial mixed reality study

An initial study that breaks down narratives using the process of extract-shape-blend-experience provided valuable insight into the application of mixed reality in the process of understanding a narrative.

Using written text, recorded interviews, and images from the story of a Mexican immigrant's plight to cross the border between the United States and Mexico, this storyboard study extracted critical architectural elements and narrative arcs in order to analyze a narrative through the language of blended interactions [16]. This storyboard breaks down the narrative into the setting, characters, and images. These essential components are then translated to the language of blended interactions. The translation into blended components then led to the composition of a mixed reality analytical scene allowing the designer to be immersed into a blended, narrative space.



GAZE

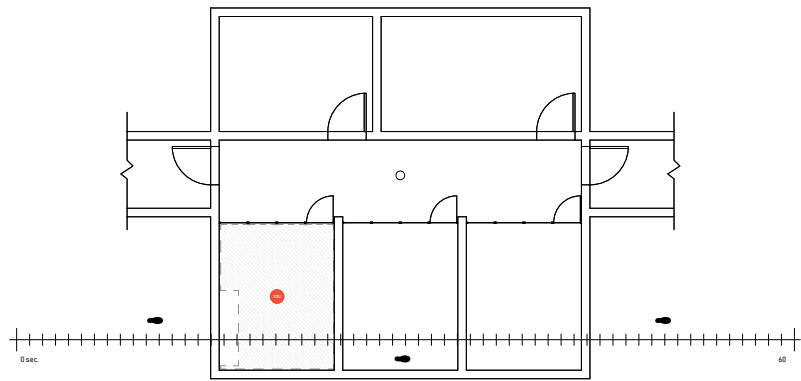


SOUND

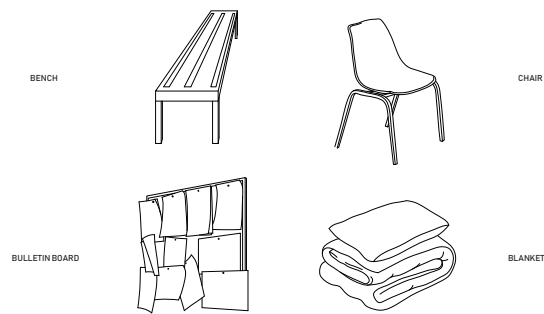
In this VR experience, four blended interactions are employed. These interactions relate to descriptions given by Mr. Cruz which provide the opportunity for the designer to engage with the space that allow you, as the designer, to immerse yourself into the story and space of the immigrant. The blended interactions are mapped and programmed within an virtual scene allowing the designer to engage with the space and story through a new analytical lens.

The first interaction is *gaze*. Waiting for the officer to say whether Mr. Cruz can leave, creates the emotion of anxiousness and nervousness. The light in the center of the holding area contrasts the dark coldness of the cell, however, very little of the light reaches the cell. Mr. Cruz can look around and see most of the holding corridor as well as a fraction of the patrol office.

Sound is the next interaction. The border patrol agent is completing the necessary tasks for the day which creates sound that projects out from the door and into the holding area. Mr. Cruz can hear muffled conversation regarding the estimated time of deportation.



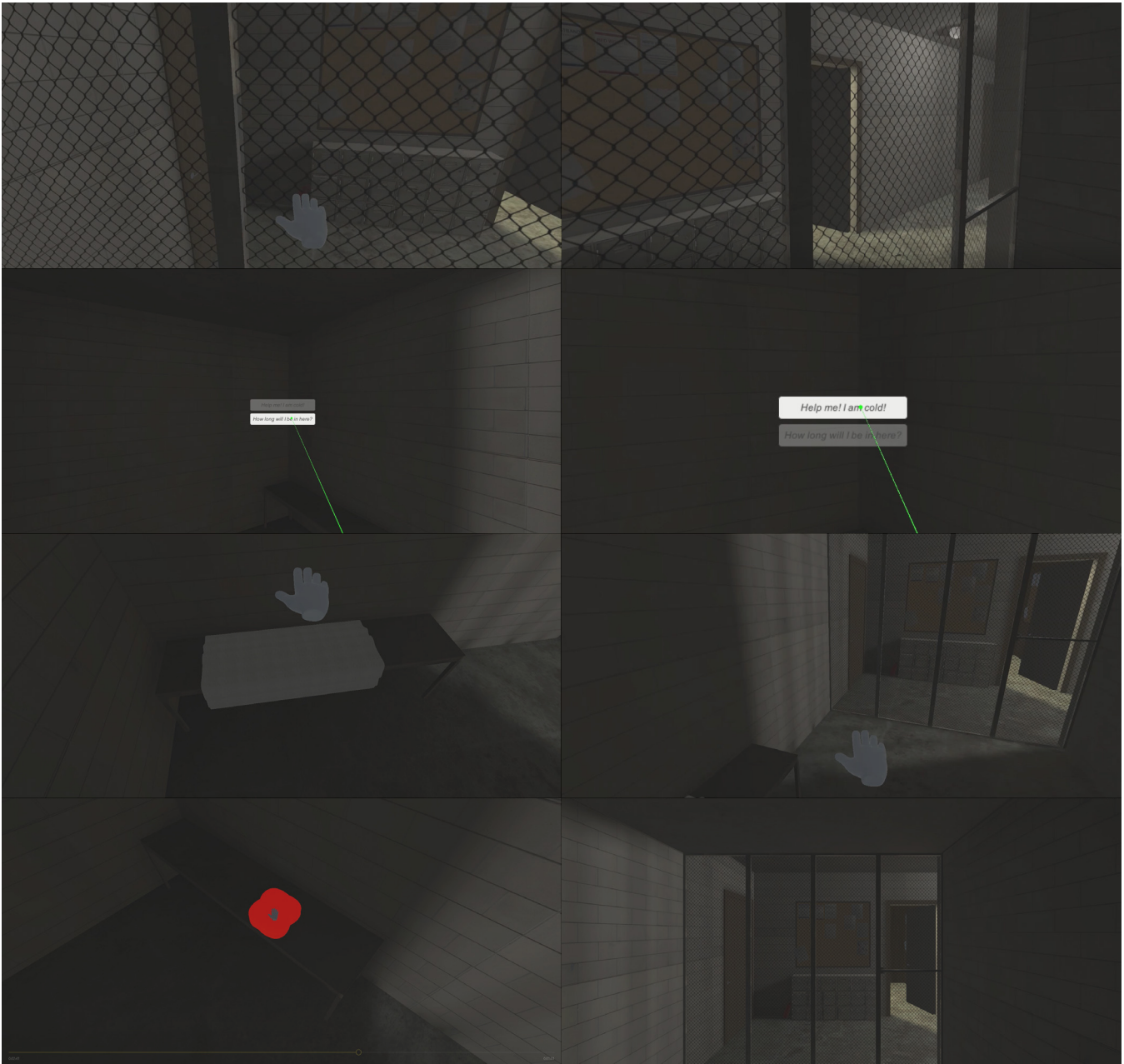
BODY PHYSICS



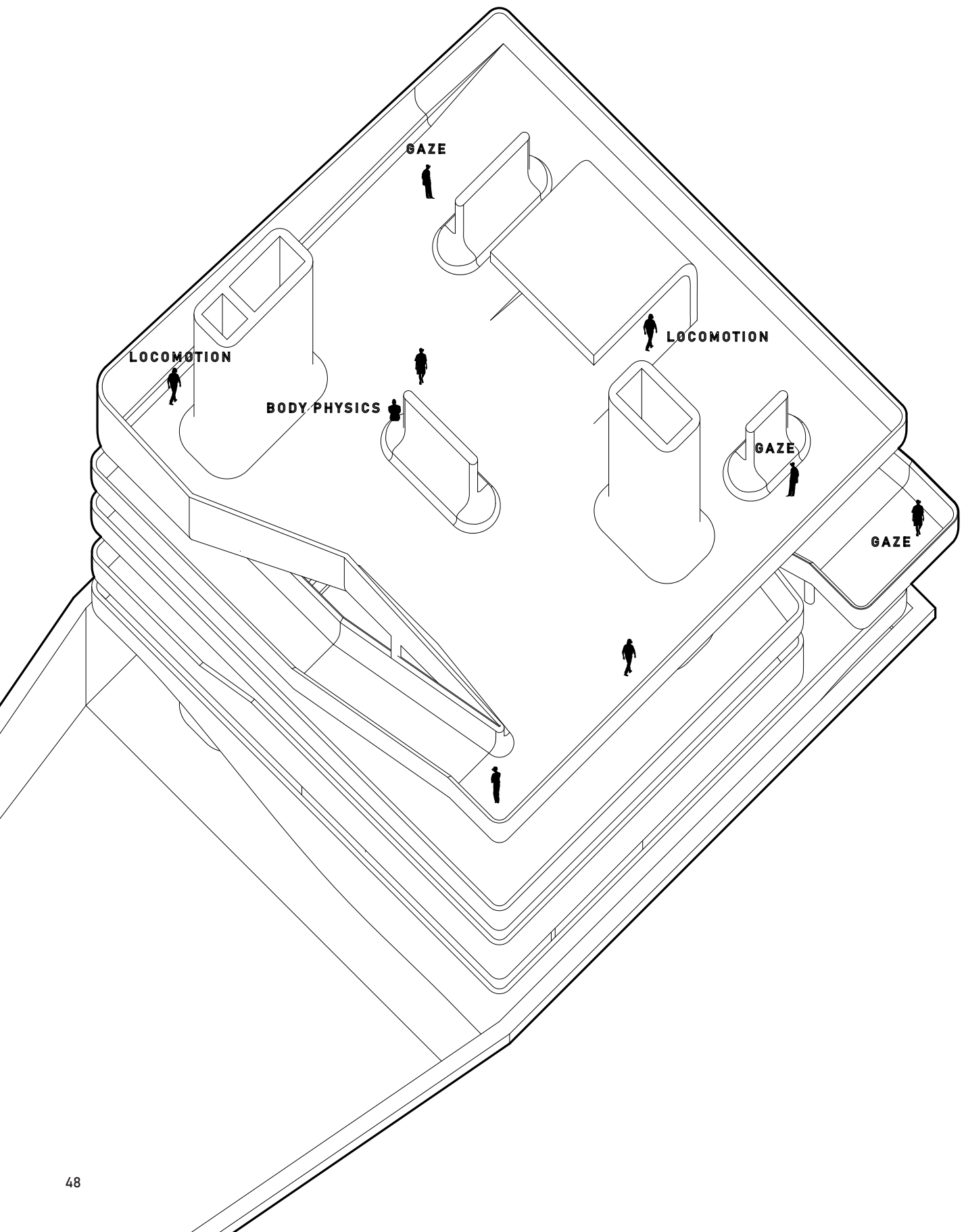
GRAB OBJECT

The next interaction is *body physics*. The long journey of traveling has left Mr. Cruz tired and slow. He is only able to move within the cell boundaries. These interactions provide the opportunity to experience the coldness of the cell, as well as the limited area to move around in.

The final interaction is *grabbing*. These objects are interactable and are only accessible by engaging the space. This interaction provides the designer with the opportunity to have a physical-mental connection with this virtual space.







04

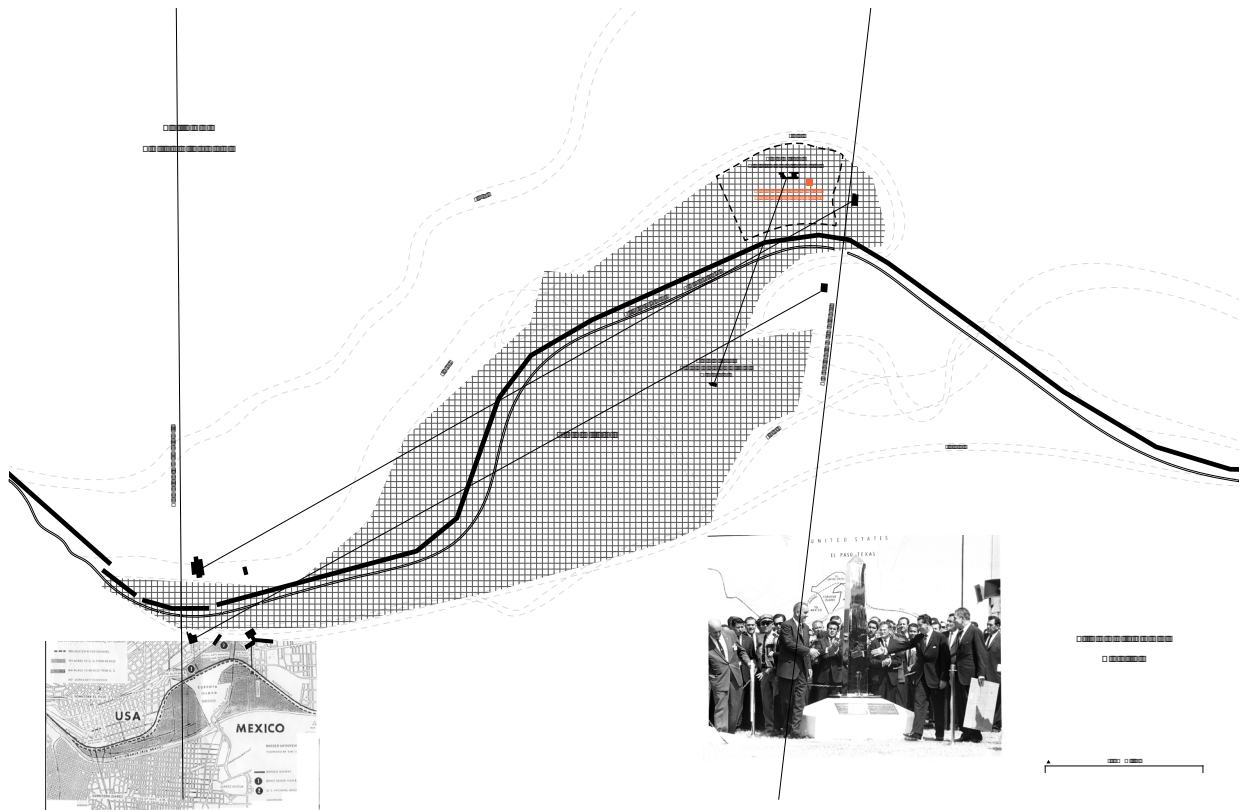
border stories archive center

mixed reality archive and museum

In order to study how the idea of blended space is applied, I developed a project for a Border Stories Archive Center along the US/Mexico Border. The Border Stories Archive Center is a museum and archive that is an example of blend space, a simultaneously physical, augmented, and virtual architecture.

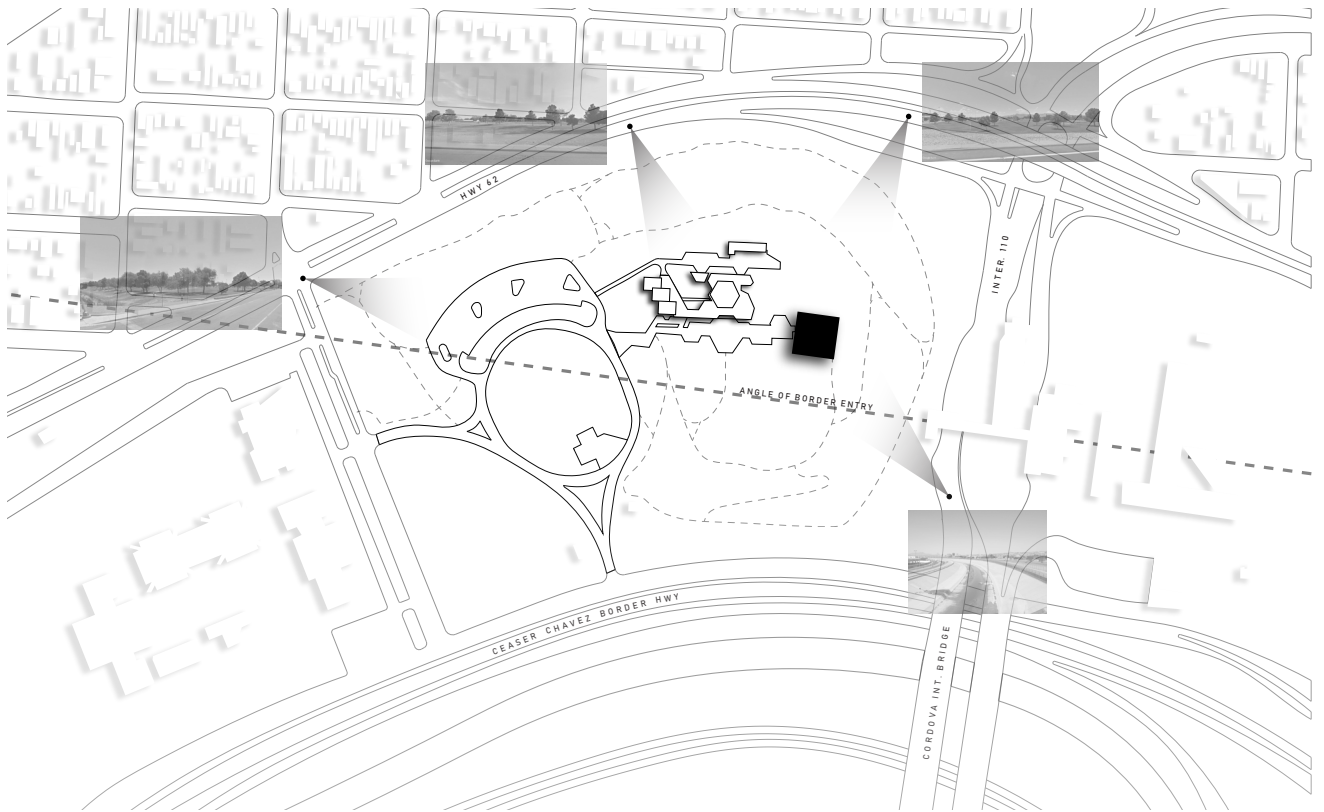
The program is categorized into service, archive, and museum. At the entrance, a MR headset station is positioned to give visitors the hardware for experiencing the narratives. The archive includes a physical library, digital archive, interview rooms, recording studios, offices, and workshop spaces for educational groups. The museum is primarily composed of physical and virtual exhibition space but also includes an observation deck.

This building is not intended to be a static museum, but rather a dynamic space that changes as narratives change. Within the museum and exhibition spaces, images and video feeds provide unedited data for the user to interpret without manipulation by the designer. Also, the idea is that this museum provides an architectural base for digital artists and curators to create various, rotating exhibitions that employ blended interactions to express the narrative.



The narrative of this project refers to the lifestyles of people within the borderlands region between the United States and Mexico, a place in which I have spent seven weeks engaging with numerous people on both sides of the wall. Their adjacency to the border molds various lifestyles, which exposes the asymmetrical structural processes that exist in this region. I believe that architecture coupled with mixed reality technology can be used as an effective vehicle to share these stories through spatial and sensory immersion.

I understand that this is contentious subject to choose as a case study, however, I believe that my research regarding architecture's relationship to storytelling through a blended use of mixed realities, can, in the least, foster discussion about architecture's role in difficult social and political arenas.



El Chamizal

The site of the Border Stories Archive Center is located along the US-Mexico border. This border is the busiest and among the most contrasting international borders in the world, with over 1 million crossing daily. It is the ninth longest in the world and fourth longest in the Americas, with an area bigger than Spain or Sweden and a population larger than Guatemala or Portugal. It is a dynamic site that encompasses modern global issues that range from migration to trade to international relations to national sovereignty [32]. Specifically, this building is located on the border in the town of El Paso, Texas.

Located adjacent to the Rio Grande, the site for the Archive Center is intentionally situated on piece of land that depicts the ways in which the border molds lifestyles. After the Mexican-American War, the Rio Grande was established as the border between the United States and Mexico. Over the last two-hundred years and thanks to many floods, the Rio Grande has shifted course multiples times, causing the border to shift and ultimately disappear. This no-man's land, once known as El Chamizal became a disputed region that wasn't settled until the 1960s. Both nations agreed to divide the territory and construct a concrete channel to cement the course of the river, and thus the border. Landowner's lost land and families were separated, ultimately changing the way people lived on this site.



narratives of lifestyles

Just as the building responds to the lifestyle narrative of the site, each floor plate within the building is shaped by its own narrative. Through my observations as well as first person accounts from interviews, documentaries, biographies, and images, these narratives trace human stories and the associated architectural spaces of the borderlands region. In particular, I am using the testimonies collected by writers Laura Velasco and Oscar Contreras, which illustrate a sampling of the *Mexican Voices of the Border Region* [23]. In their collection, four lifestyles emerge: The Border Never Crossed, The Border as a Backdrop, The Everyday Border, and the Border Traversed. According to Velasco and Contreras, each of these lifestyles possess a core theme. These are: Uncertainty, Dependence, Opportunity, and Advancement.

Using these themes, the project began the blended narrative design process.



the border never crossed

uncertainty

refers to the lifestyle of the border never crossed, or residents on the Mexican side who have not crossed into the United States but whose lives are imprinted by the region's border identity [23].



the border as a backdrop

dependence

refers to the lifestyle of the border as a backdrop, or individuals who cross the border only occasionally, but whose lives are structured around commercial transactions typical of border zones or who have trans-border family ties [23].



the everyday border

opportunity

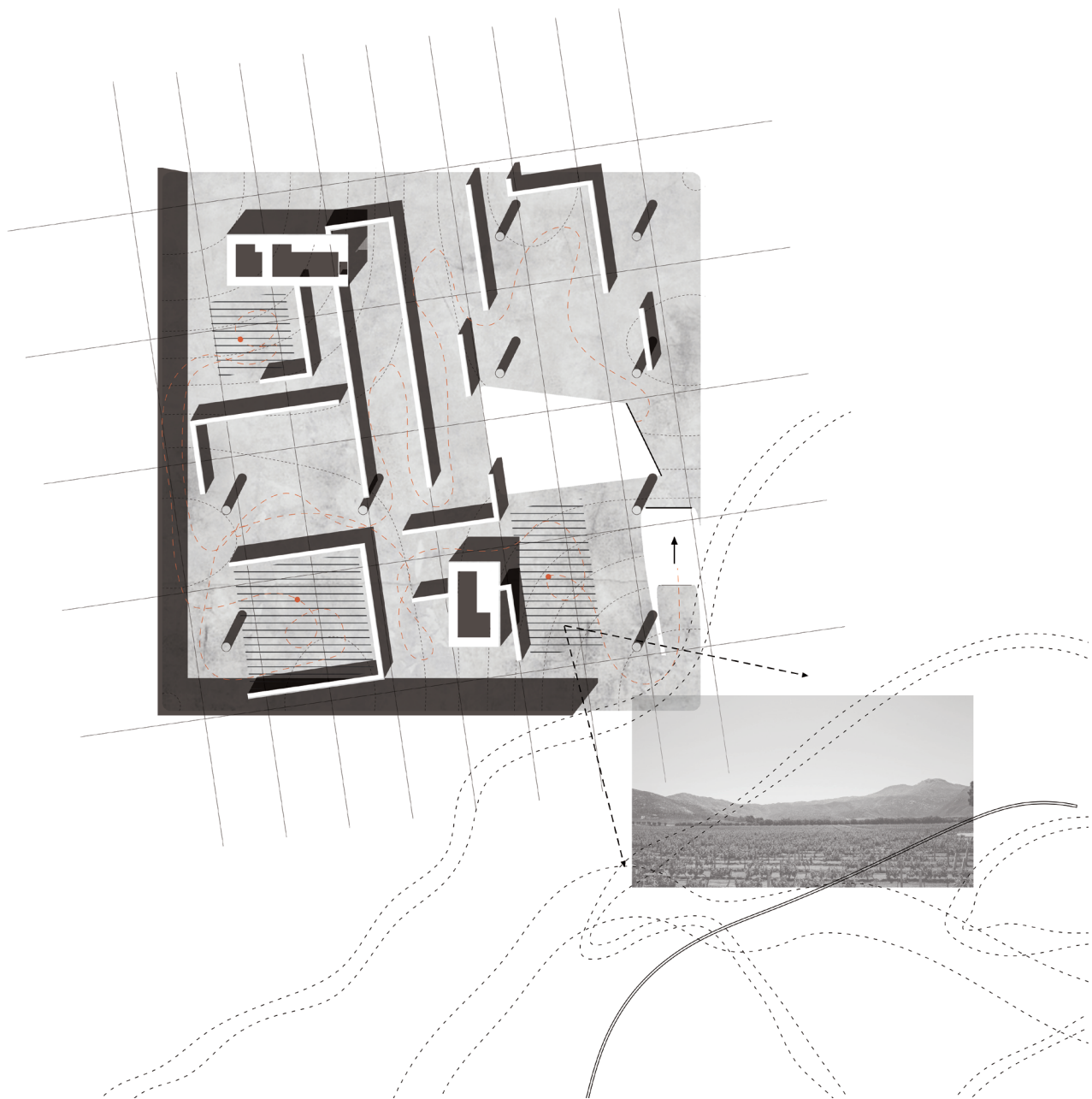
refers to the lifestyle of the everyday border, or individuals who have made crossing their primary means of survival [23].

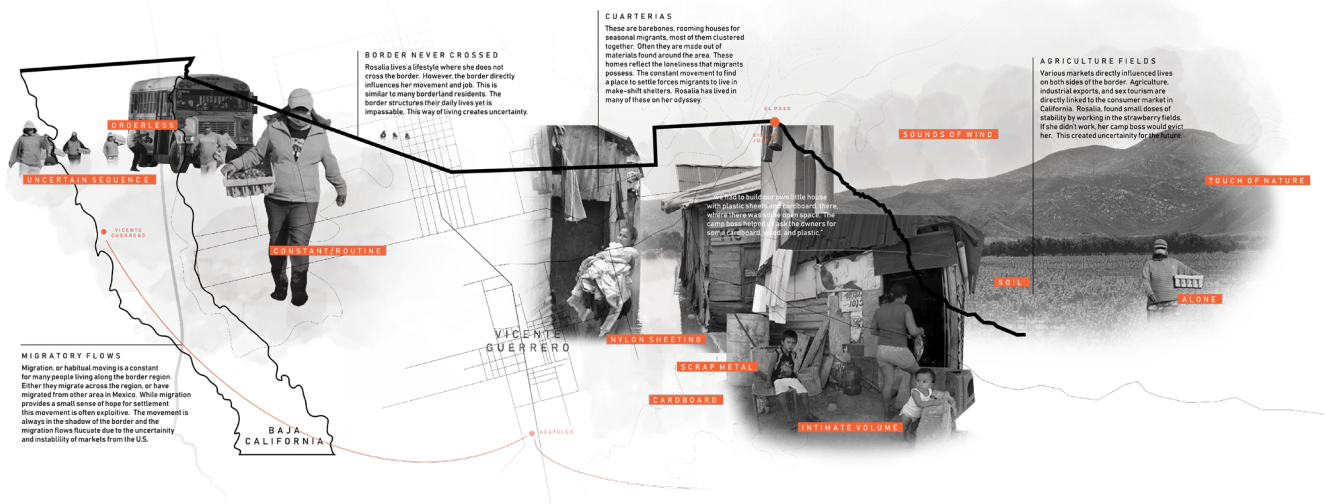


the border traversed

advancement

refers to the lifestyle of the border traversed, or individuals who have traversed the border and established themselves in the United States [23].





uncertainty

In the narrative of *Uncertainty*, the story of Rosalia, a migrant agricultural worker in the Baja California peninsula, evokes a sense of constant migrating then settling, yet the lifestyle is controlled by other forces at the border thus creating a sense of orderlessness. The migrant camps that she travels to are intimate complexes of shacks that are composed of loose scrap metal, cardboard, and nylon sheeting. Working in the fields is the only sense of stability, though most of the day is spent alone [23].

These extractions allowed the physical architecture to then be shaped in response to the specific narratives. Beginning with a simple floor plate, the grid of the uncertainty floor mimics the spacing of the migrant camps. Along these lines, vertical surfaces are extruded creating intimate spaces that have an uncertain sequence. Views of the border are blocked by high exterior walls, however, the walls open up to a specific view of the agricultural sites adjacent to this border town.

"Rosalia's home has a small wooden door that opens onto the street. Her family is one of the few Mixtec families that live in the Triqui colonia. The patio is furnished with white buckets that are used in the tomato harvest. After a long workday, Rosalia washes her feet while her three children circle the patio, by only a bare light bulb hanging from the ceiling. Darío, her eldest son, washes his hands in an attempt to dissolve the sticky residue left by a day of picking strawberries. It is April, and the heat in the valley indicates the optimal time for harvesting. Rosalia offers her visitors upturned buckets to sit on and, with a smile, begins to recount the story of her life."

"[My name is Rosalia.] I'm thirty-eight years old. I was born in 1968 in San José de las Flores, in the municipality of Punta Villa de Guerrero, in Oaxaca State. My mother spoke an indigenous language, my father also, though they came from different towns. My mother was from San José de las Flores, in Oaxaca, and my father was from Chilpancingo, in Guerrero. There were two of us - me and my sister, who is three years younger than I am."

VR STORY EXPERIENCE - AGRICULTURE



BODY PHYSICS

LOCOMOTION

GRID OF MIGRANT CAMPS

TACTILE FEEDBACK

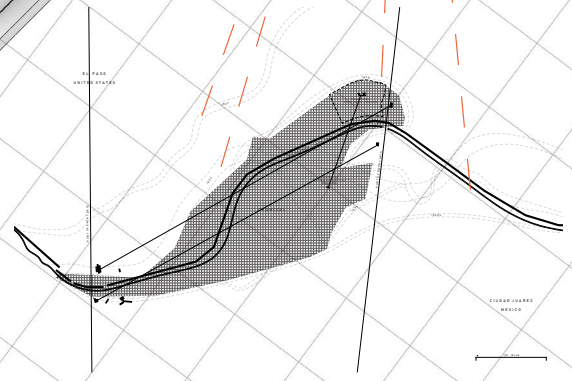
SOUND OF WATER SLOSHING

LOCOMOTION
VR STORY EXPERIENCE

SOUND

"...everything was just vacant land... lots of thorns and cow pies. There were even tarantulas and scorpions - dangerous animals! We settled at the edge of the highway, that's where we were living. In the beginning, there were little cardboard houses that we roofed with planks, and we used tarps and nylon sheeting to protect us from the wind. The children were still small: the oldest was ten and the youngest, four."

LOCOMOTION
VR STORY EXPERIENCE



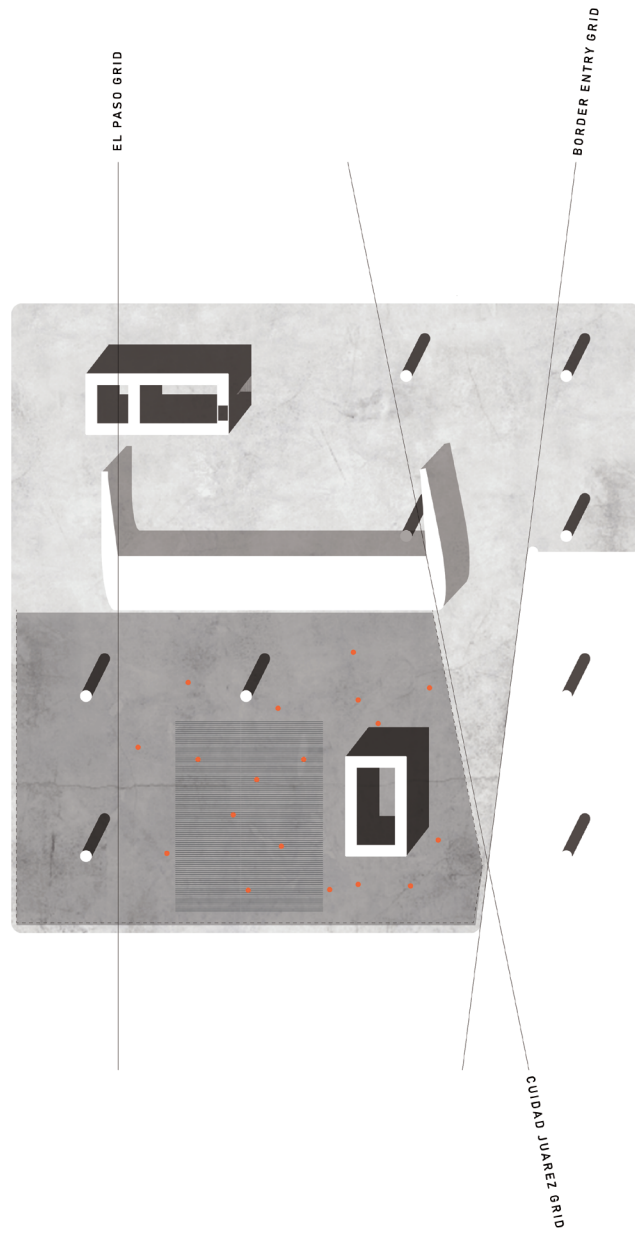
CHORAS JORJES
MEXICO

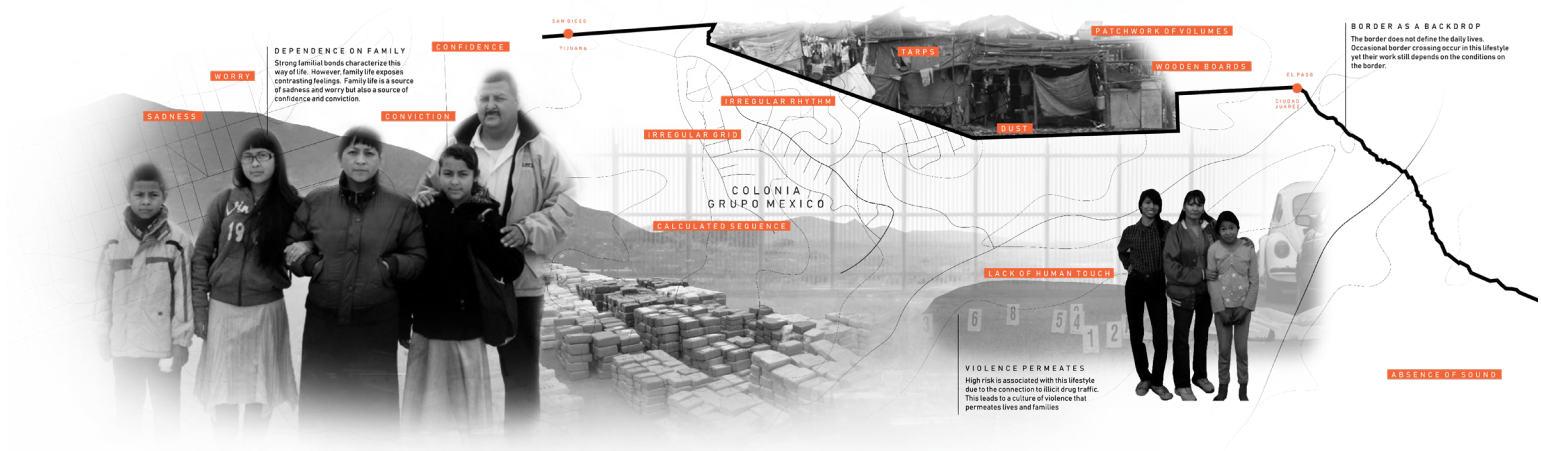
uncertainty

As the physical architecture takes shape, blended interactions are employed, establishing the concept of blend space in this narrative. For example, rounded edge transitions between the floor and walls provides users the ability to feel the edge without running into anything while using a mixed reality headset. Altering the topography of the floor plate to simulate the feeling of working in the agricultural valleys allows users to feel the physics of their body changing.

Another blend between the realities is the interaction of gaze. Through a mixed reality headset, text, images, and videos are overlaid onto surfaces and are responsive to the location and duration of the users head position. This includes overlays about how the Rio Grande shifted course on this specific site, creating a lifestyle of uncertainty for local residents. Tactile Feedback works similar in that a controller synced to the headset can augment interaction between an object and the user, conveying narrative digitally while a texture is being felt physically.

Specific virtual scenes are marked by textures cast into the concrete floor. The user can feel the change in texture when walking into this space physically. At the same time, the user is virtually transported to an immersive virtual scene. These scenes provide deeper immersion into the narrative through a blend of physical and virtual space.

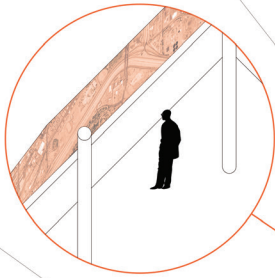




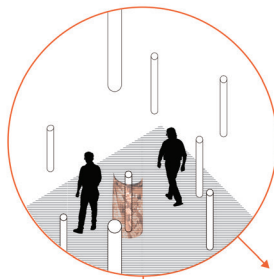
dependence

The narrative of Dependence traces the story of Juan, a man in his forties involved since childhood in the cultivation of hallucinogens and with a job history of trafficking drugs and stealing cars [22]. This story evokes a sense of conflicting emotions. Family life is a source of sadness and worry but also a source of confidence and conviction, relating to the contrast. The high risk associated with this lifestyle contributes to an irregular rhythm along with a calculated sequence. Life exists within the complex patchwork of volumes that compose each neighborhood, textured by tarps, wooden boards, and dust [23].

Beginning with a simple floor plate, the shaping of the architecture begins. The grid of the dependence floor mimics the axes of the mirroring border towns of Ciudad Juarez and El Paso, as well as the port of entry near the site. The floor is cut and peeled-up based on these axes creating an upper and lower surface. The lower surface contains tall exterior walls while above is open to the landscape, reflecting the contrast of the narrative. Within the lower space, small poles create an irregular rhythm similar to the forests where Juan grows his crop. The architecture conveys the notion of “hidden in plain sight” which refers to the Juan’s high-risk occupation.



AUGMENTED GAZE



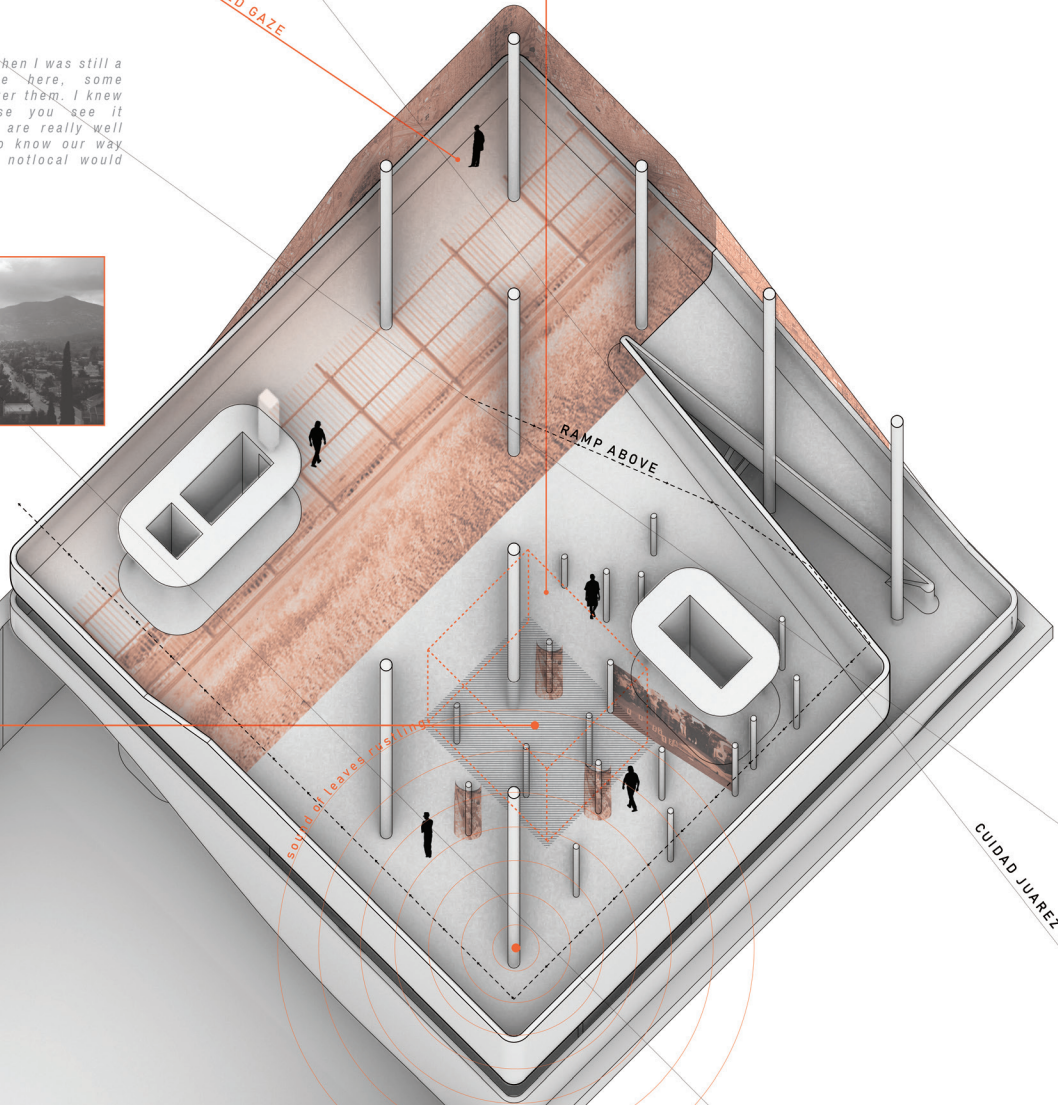
LOCOMOTION

"I just planted a little in the beginning...just for my own use. Later I grew more...I'd have some forty or fifty plants, and I'd harvest two or three small bags. It wasn't just for my own use then; I'd sell some too."

"Marijuana. I started growing pot when I was still a kid. I'd plant the seeds, some here, some there....That's why I had to go water them. I knew about growing marijuana because you see it everywhere in those parts. They are really well hidden. We're the only ones who know our way around there. Somebody who is not local would never find them."



LOCOMOTION
VR STORY EXPERIENCE



CUIDAD JUAREZ GRID
BORDER ENTRY GRID

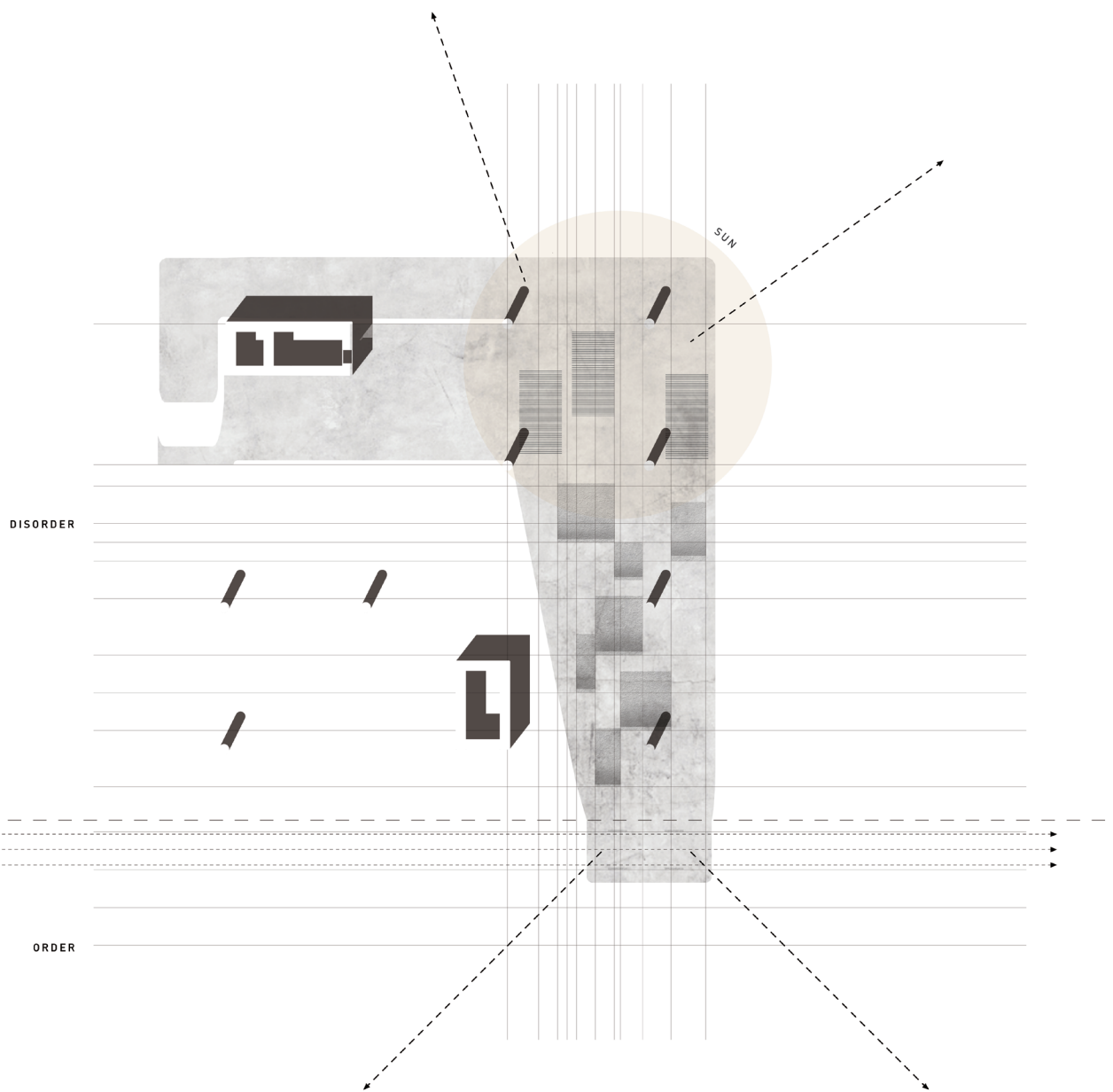
CITY OF EL PASO GRID

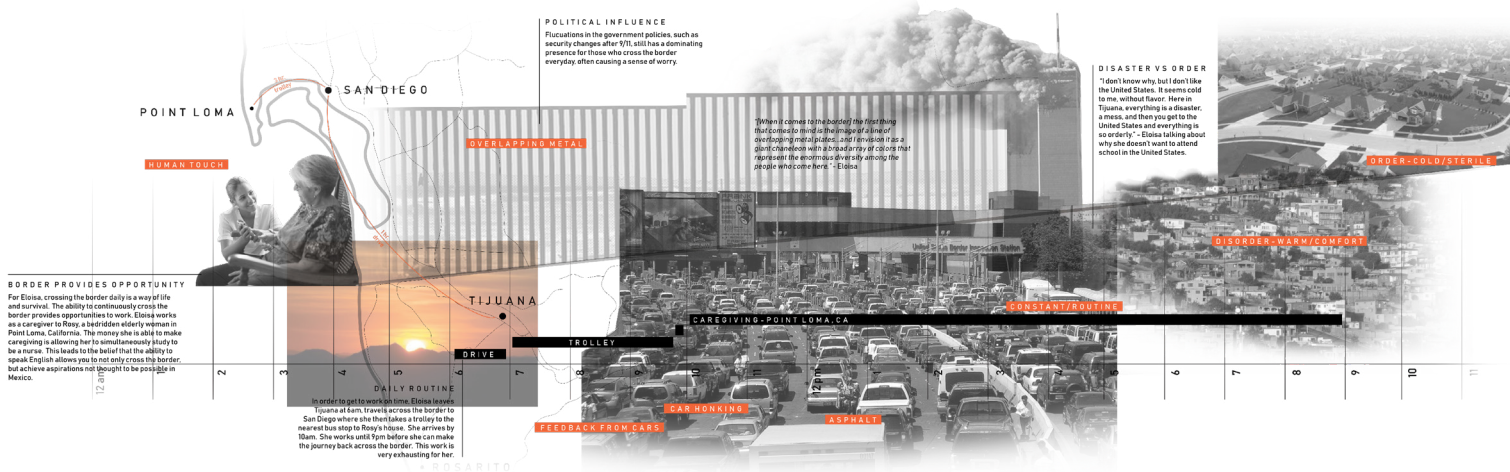
dependence

Blended interactions such as augmented gaze, locomotion, and grab are deployed in this narrative. On particular surfaces of the floor, images, text, and videos are overlaid, presenting the narrative through an unedited perspective. On the ramp that peels up from the center, a video of the border from the perspective of a helicopter provides regional context the direct connection between this lifestyle and the border. As a user uncovers this narrative, images pop-up when certain text is engaged, allowing the user to construct their own experience of the story.

Underneath the ramp, the small poles create physical barriers, altering the rhythm of circulation. This is coupled with the overlaid images that work to change the locomotion of the user through an invisible barrier.

On top of the ramp, an object allows the user to interact with the story if grabbed. When the object is grabbed, the border wall in the landscape becomes a towering wall that represents the necessary dependence on the adjacency to the border. While being grabbed, a recorded interview with a border resident plays within the mixed reality headset, providing a real account of this lifestyle. Here, sight, sound, and touch are all blended into a cohesive experience.





opportunity

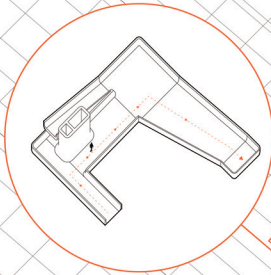
The narrative of Opportunity follows the story of Eloisa, a twenty-six year-old woman whose family is dispersed on the two sides of the border. Eloisa is a caregiver for an elderly woman in California and this opportunity takes advantage of the salary differential between the two countries [23]. Eloisa uses her relationship with the border as her means of survival as it provides an opportunity to work in California for better wages. She has a consistent daily routine where she leaves for work at six in the morning and doesn't return home until after nine in the evening [23]. She is constantly in transit, but always has to return home to Tijuana. For Eloisa, the border represents a series of overlapping metal plates while simultaneously a giant chameleon with a broad array of colors that represent the enormous diversity among the people who come to Tijuana. She doesn't like the United States, stating that it is cold, orderly, and has no flavor. Tijuana, on the other hand is a disaster and a mess, but that is what she likes about it [23].

The grid mimics the conflicting conditions of disorder and order that pervade each side of the border. The floor is shaped into a series of ramps that reflect the continuous routine of crossing the border daily, while having to return in the evening. A set of smaller ramps are laid out in a haphazard manner which forces users to respond to the irregular rhythm by jockeying around which is similar to the cars waiting in line to cross the border. This leads to the moment where the architecture extends past the facade.

VR STORY EXPERIENCE



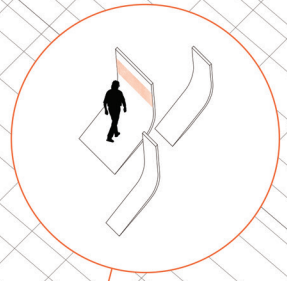
It's five o'clock in the morning. The sun is rising, turning the sky to marine blue. The line of cars at the international border snakes all the way back to Second Street in downtown Tijuana. Drivers jockey for a place in the fastest line. "Get in the left lane! It's the fastest!" This is the advice offered by all of the commuters who cross the frontier every day on the way to their jobs in the United States.



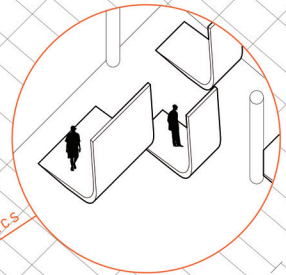
BODY PHYSICS

LOCOMOTION
Sound of cars jockeying

DISORDER GRID



TACTILE FEEDBACK



BODY PHYSICS

STRONG WINDS

GAZE

LOCOMOTION
VR STORY EXPERIENCE

As afternoon fades to evening, a long string of cars brings the workers back home, but this border crossing is quick. No one asks for documents when you enter Mexico. Eloisa is at the taxi stand on the Mexican side, back from her day of work in the United States. She has gotten off the bus and passed through the turnstile with a firm step. She smiles from a distance. Her dark eyes are enormous, and they shine with the luster of a warrior triumphant in battle. Behind, dozens of stands selling tacos and tourist souvenirs flank the corridor that leads to Avenida Revolución.

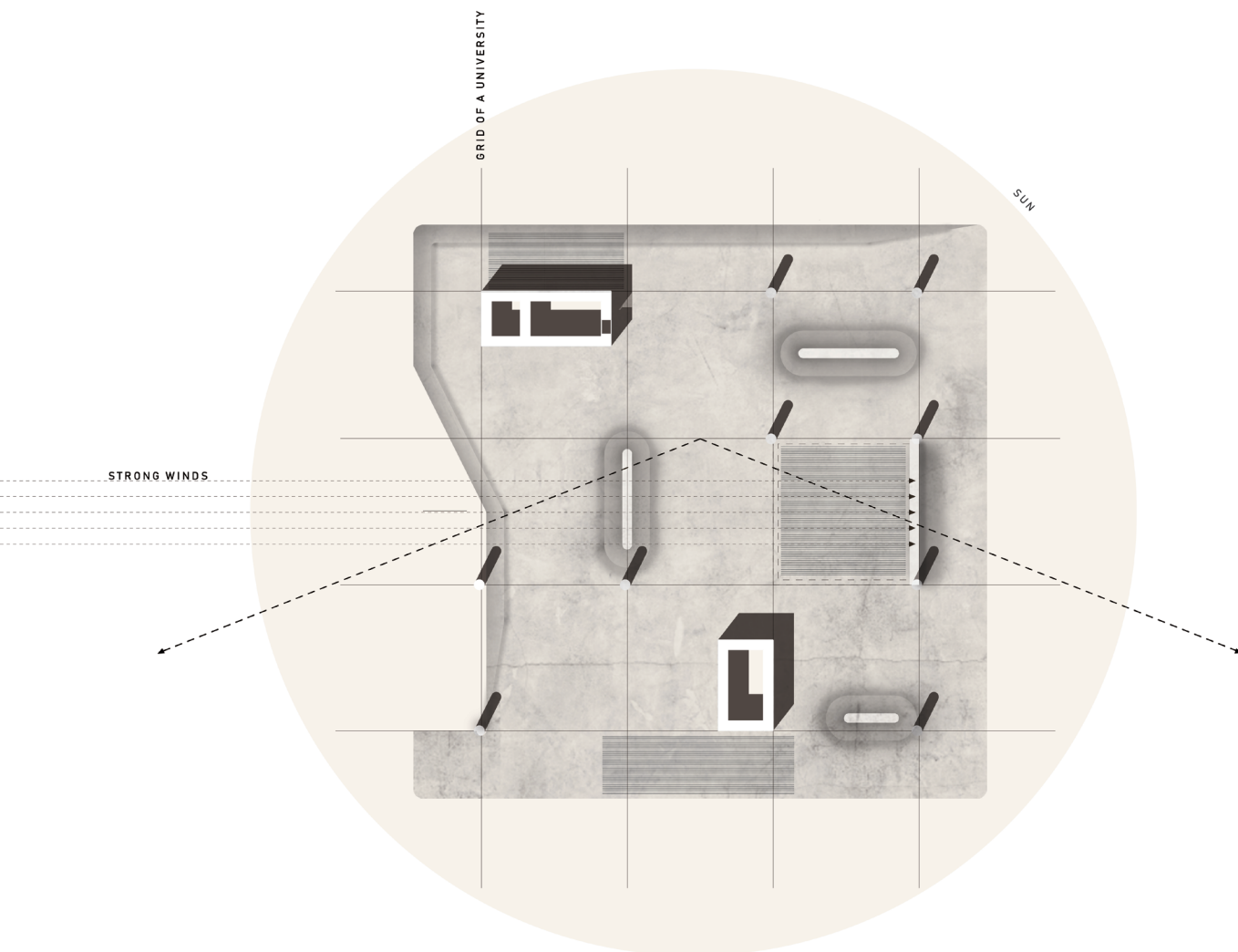
ORDER GRID

opportunity

The series of ramps express the blended interaction of body physics. The user's center of gravity shifts as they physically walk up and down, connecting the visual experience in the headset with the physical experience of the architecture. As the user moves onto the smaller set of ramps, a texture is physically felt while an augmented narrative is paired in the headset, demonstrating the blended interaction of tactile feedback.

On the observation deck, augmented gaze interactions depict the narratives on the local site which express the many businesses that thrived in the no-man's-land of El Chamizal due to its lack of government and location between two countries.

The virtual scene depicts the narrative of waiting in line to cross the border, a journey that Eloisa makes every day. It is composed of cars honking, street vendors selling goods, and the texture of asphalt underneath.

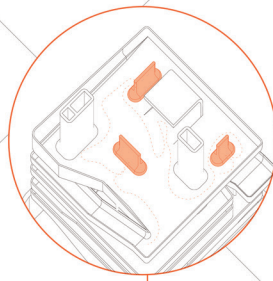




advancement

The narrative of Advancement traces the story of Emilio, a twenty-two-year-old member of the 1.5 immigrant generation who has assimilated to American values and is pursuing higher education [23]. His border is the dividing line between backwardness and progress while simultaneously he idealizes Mexican patterns of personal relationships which includes emotions of warmth [23]. This nostalgic perspective refers back to the intimate spaces where Emilio would play soccer in the street with his friends, surrounded by the unique architecture and art scene that exists in Mexico. Now, when he returns to Mexico, it is for leisure; for meandering through the market; for relaxing on the beach listening to the waves crash on the shore [23]. The border is fluid, almost transparent [23].

This floor is structured on a wide grid, similar to those in America and on college campuses. The entire floor is exposed to the elements, harnessing the wind and sun. Three extrusions from the floor provide a place for the user to sit and rest, taking in the narrative leisurely. Together, the benches with the sun and wind contribute to the nostalgic and leisurely perspective of this narrative.



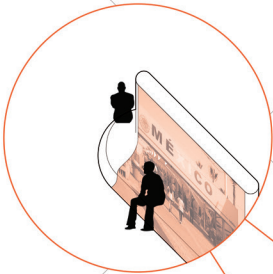
LOCOMOTION

VR STORY EXPERIENCE - LEISURE

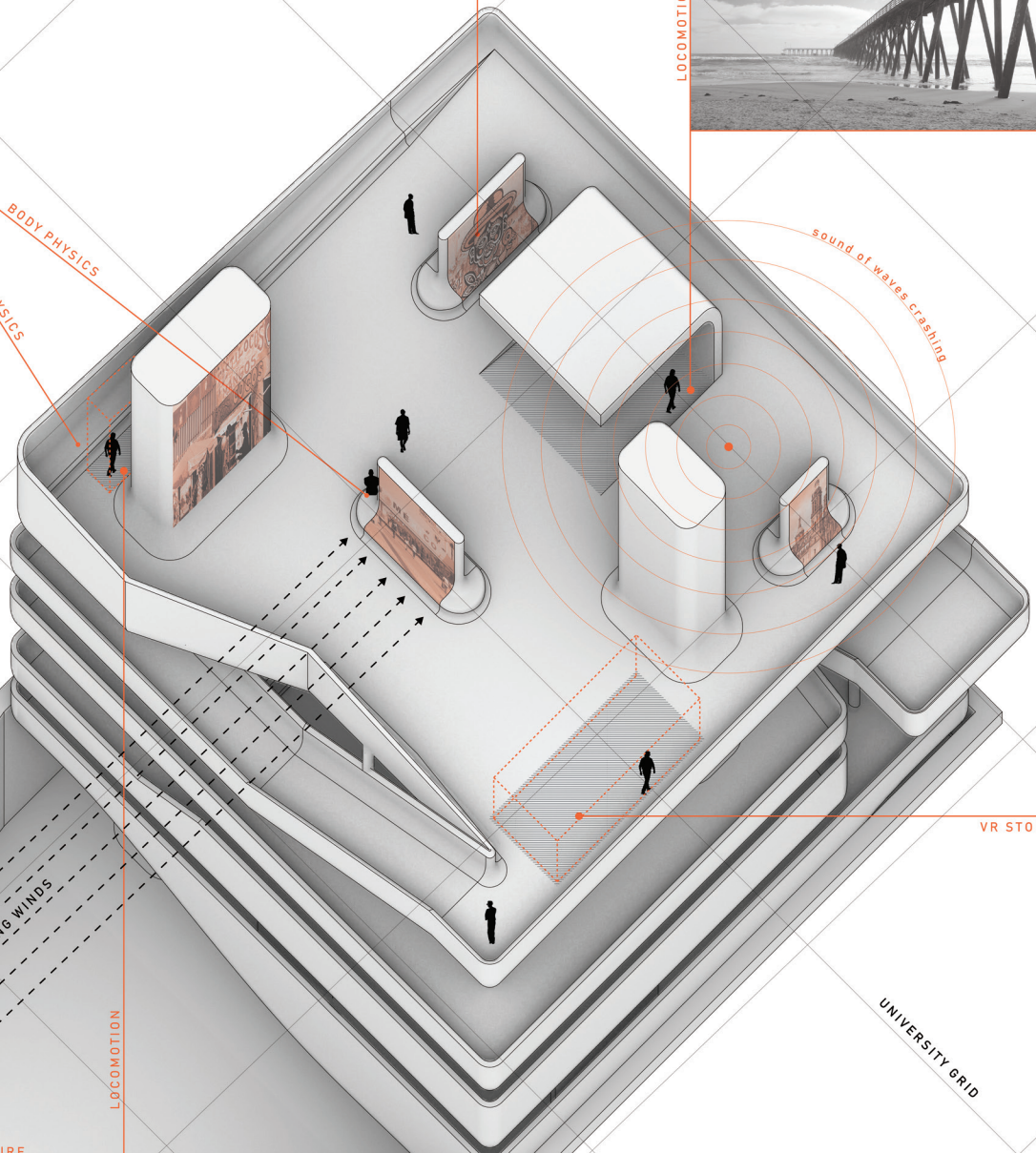


LOCOMOTION

sound of waves crashing



BODY PHYSICS
BODY PHYSICS



LOCOMOTION
VR STORY EXPERIENCE

VR STORY EXPERIENCE - LEISURE



"Yesterday I went to play soccer at the fields, and I realized that the kids in Tijuana still play sports outside, in the open air. You don't see that in the United States, maybe because there's lots of gang violence in the United States."

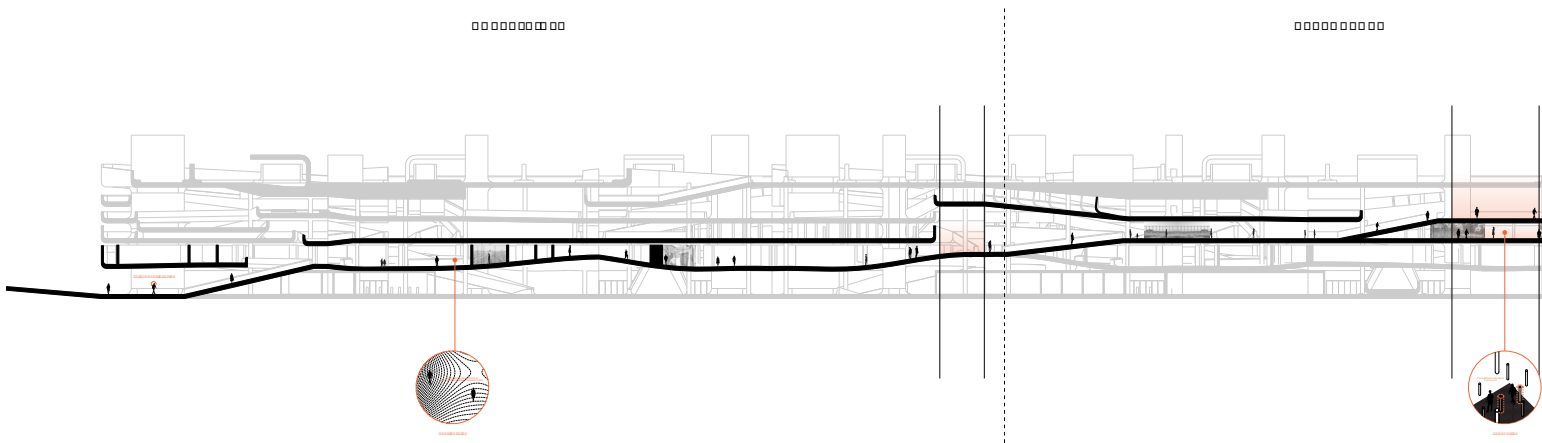
advancement

The extrusions from the floor create sitting space for users, effectively changing their center of gravity and body physics. The sitting space transitions to a flat surface which gives users the ability to interact through augmented gaze, revealing further information about the narrative. Many of the surfaces on this floor provide opportunities to interact through gaze.

The openness of this floor gives users a 360-degree view of the surrounding landscape, however, through the interaction of augmented gaze, the border wall is transparent, reflecting the fluidity of the border in Emilio's story.

Peeling up from the floor, a small space is created. This moment harness the wind from the west and is coupled with sounds of waves crashing which are overlaid in the headset.

The fully virtual scene on this floor presents a narrow alley in-between houses where the user can interact and simulate a soccer match between others. This provides a leisure and social experience for the user, relating to Emilio's fond memories of growing up in Mexico.

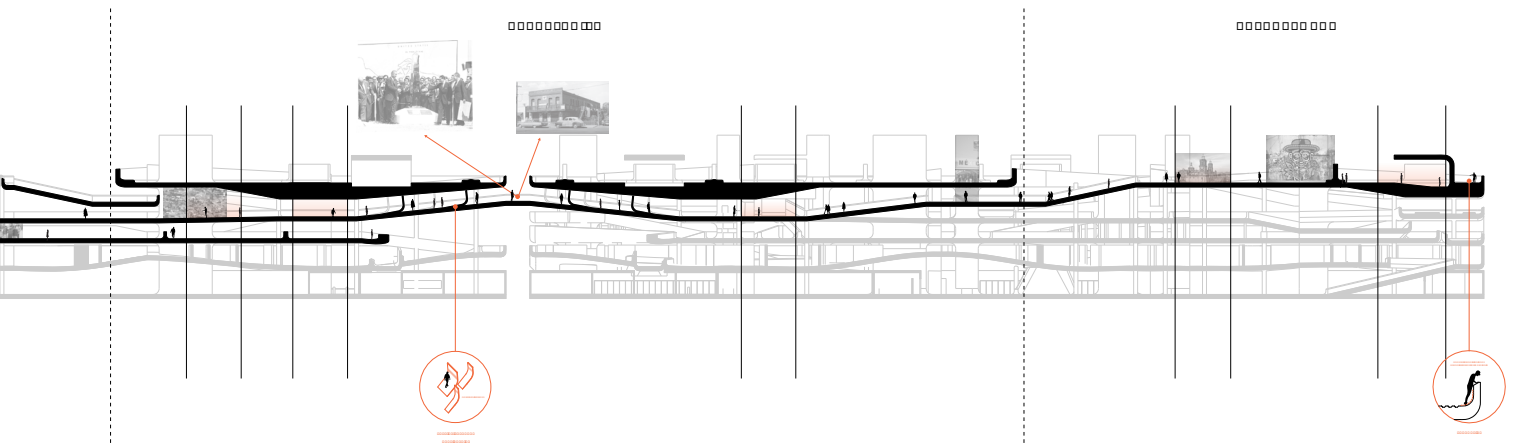


Montage of Narratives

As you enter the building, you process down a large ramp removing you from the surrounding reality. On the entry floor, you grab a mixed reality headset, then make your way up to the uncertainty floor. The interior walls create spaces that demand an uncertain sequence, while the undulating topography of the floor also creates uncertainty. The interior volume expands and contracts as you move through. Image and video overlays depict unedited scenes of this lifestyle.

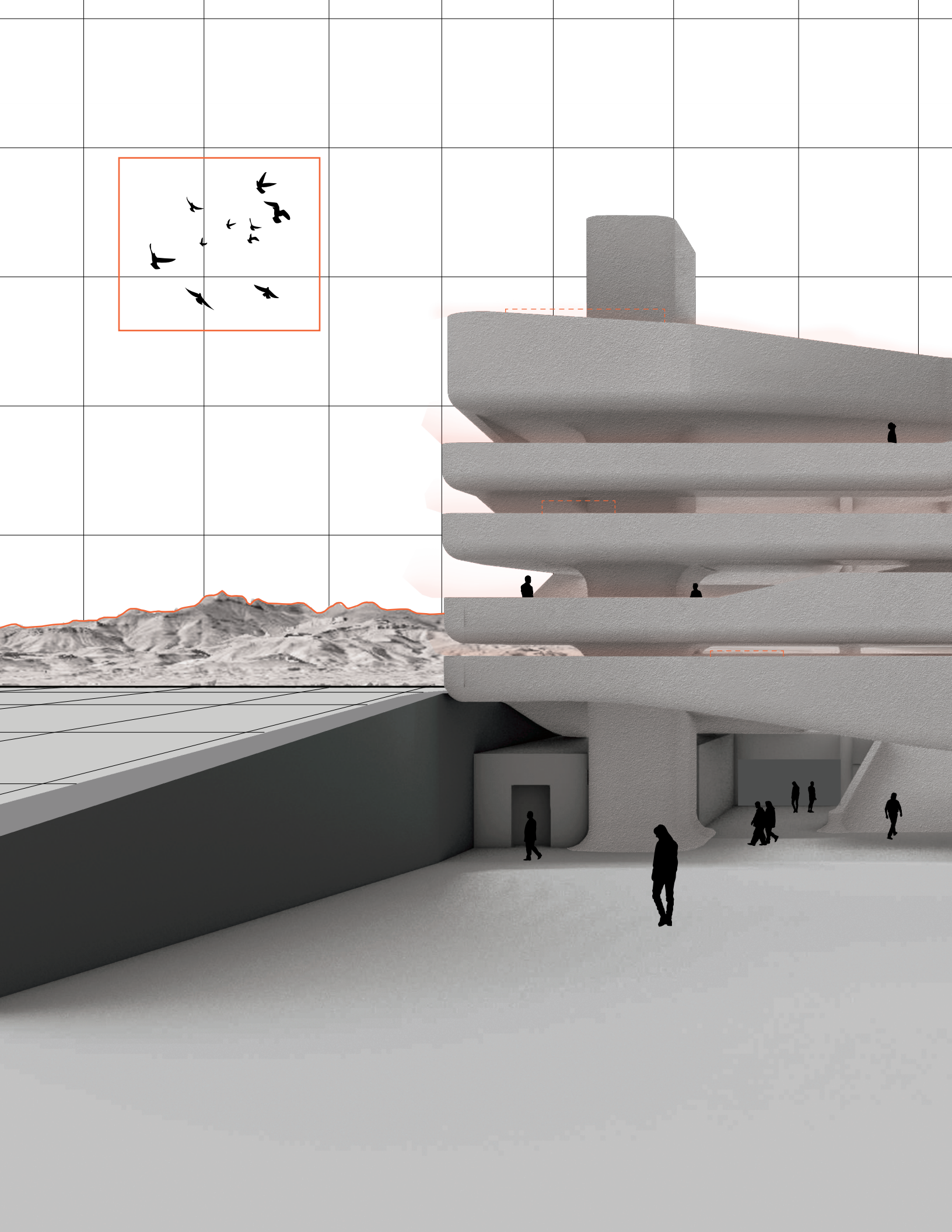
Another ramp takes you up to the dependence level where the floor splits, creating a dark, cold space underneath which is hidden in plain sight with a high volume, open-air space above. In section, these dichotomous spaces reflect the contrasting experiences of confidence and worry that are prevalent in the dependence narrative.

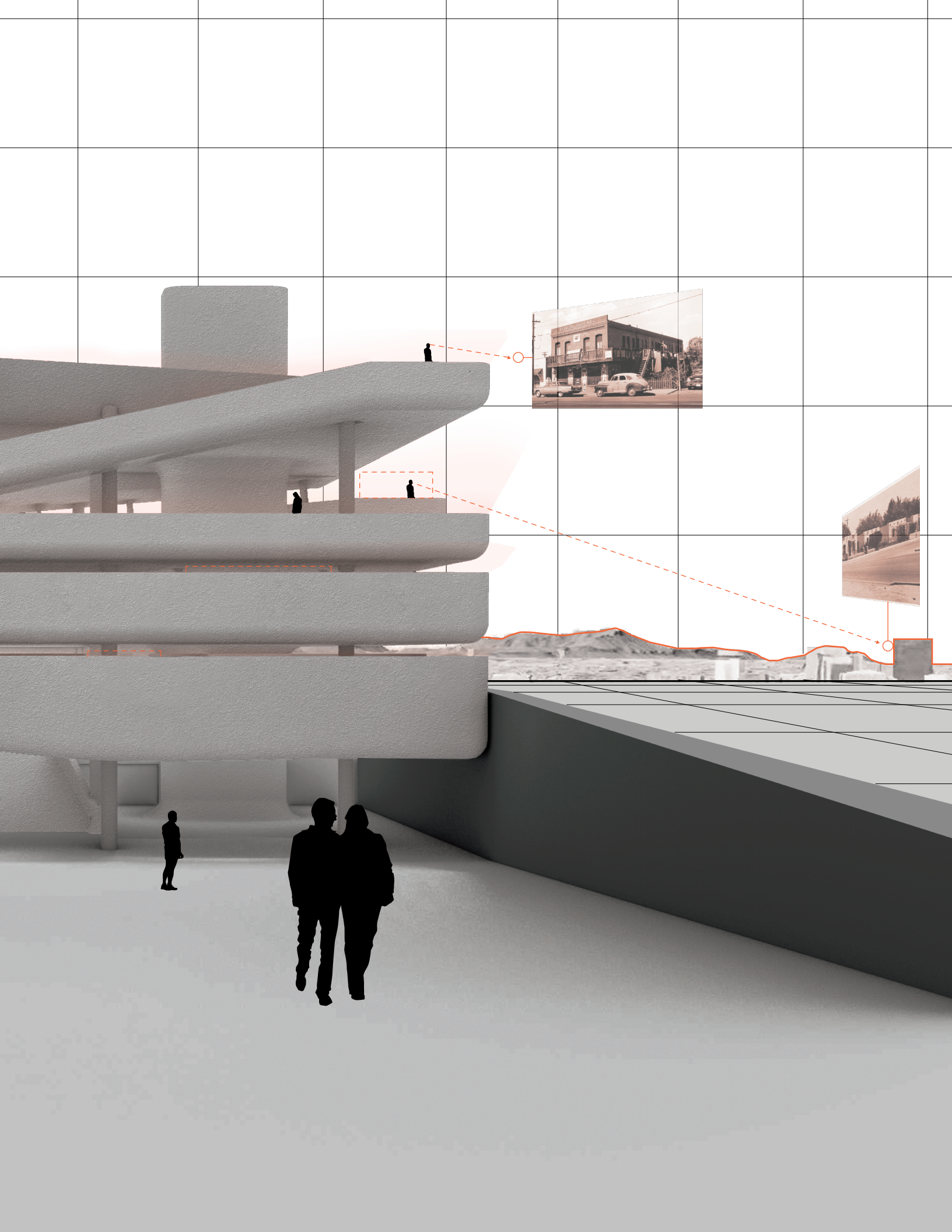
As the promenade continues, the opportunity level consists of a series of ramps, altering your body physics, sense of gravity, and speed. The constant moving up and down reflects the routine of crossing the border and returning home daily. The floor reaches out past the facade of the building, a moment to breathe and engage with the site.



The promenade finishes on the floor of advancement, which is fully exposed to the site elements, presenting a clear view of the surrounding context. This openness evokes the sense of transparency that is present in this lifestyle, where the border becomes fluid and seemingly transparent.

Overall, the promenade takes on a filmic quality, mimicking a montage of the stories that exist within this region and illustrating the ability of the blended space to work physically, augmented, and virtually.





BOUNDARY OF THE UNITED STATES OF AMERICA



INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

WARNING
THE DISPLACEMENT OR DESTRUCTION OF THIS
MARKER CONSTITUTES A FEDERAL FELONY
PUNISHABLE BY THE UNITED STATES AND MEXICO

VR STORY EXPERIENCE

TACTILE

LOCOMOTION

SOUND

BODY PHYSICS

... o'clock in the morning. The sun
... turning the sky to marine blue.
... of cars at the international
... makes all the way back to Second
... downtown Tijuana. Drivers
... a place in the fastest line.
... the left lane! It's the fastest!"
... advice offered by all of the
... who cross the frontier every
... way to their jobs in the United
States.



05

conclusions

As I conclude this research, it is important to reflect on the significance of mixed reality's application in architecture. Our society is trending toward a world of mixed reality, allowing us to see visual overlay of information and data that was once invisible. These new forms of reality have the potential to positively impact our experiences of space. This is a reality that is rapidly approaching and architecture needs to consider this visual experience in design.

That being said, architecture should take an active approach in its engagement with mixed reality technology. Instead of a white box approach, there are more possibilities outside of passivity and I challenge the profession to engage and embrace this technology as we continue to push our profession forward.

06

bibliography

bibliography

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